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A National Environmental/Energy Workforce Assessment. Ohio

National Field Research Center, Inc, Iowa City, Iowa

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A National Environmental/Energy Workforce Assessment

OHIO

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This study is one of 70 volumes assessing the workforce needs (manpower needs) for pollution control and abatement in the United States for the five-year period of 1976 through 1981. Seven fields for pollution control — air, noise, pesticides, potable water, radiation, solid waste, and wastewater — are analyzed, together with energy-related programs currently accentuated by the national effort to solve energy supply problems.

Designed as Phase I of a three-phase program, the complete assessment includes the following volumes: one each for the 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands; one for each of the ten EPA regions; a one-volume National Abstract; a volume on National Legislation; a volume on Business and Industry; and a four-volume National Summary. The information was gathered through extensive personal interviews with responsible federal, state, and local officials in every state; with officials of representative private industrial and commercial firms; and with representatives of national industrial and trade organizations.

Phase II will develop a broad national inventory of the entire range of post-secondary and higher education training offered in the pollution control and energy areas cited above, and Phase III will offer demonstrations for curriculum changes or modifications which appear necessary to assure an adequate and properly trained national environmental/energy workforce.

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TABLE OF CONTENTS

Page

ILLUSTRATIONS iii
ACKNOWLEDGEMENT vi
PREFACE vii
FOREWORD viii
STATE SUMMARY 1
STATE PROFILE 14
POLLUTION CONTROL AND ABATEMENT AGENCIES 17
POLLUTION CONTROL AND ABATEMENT PROGRAMS 21
- I. Air 22
- II. Noise 39
- III. Pesticides 47
- IV. Potable Water 64
- V. Radiation 76
- VI. Solid Waste 83
- VII. Wastewater 91
- VIII. Energy 109

U.S. ENVIRONMENTAL PROTECTION AGENCY ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO 117
SELECTED POST SECONDARY INSTITUTIONS WITH FORMAL ENVIRONMENTAL/ENERGY PROGRAMS 129
STATE LEGISLATION 135

NOTE: The Selected Bibliography is appended to each Regional Report.

ILLUSTRATIONS

Figure		Page
1	Ohio Environmental Protection Agency	20
2	City of Cleveland, Division of Air Pollution Control	37
3	Ohio Environmental Protection Agency, Air Pollution Control Programs	38
4	Ohio Department of Natural Resources, Division of Water	75
5	Ohio River Valley Sanitation Commission	107
6	Cleveland Regional Sewer District	108
7	Ohio Energy and Resource Development Agency	116
8	U.S. Environmental Protection Agency, Office of Research and Development Laboratories	127
9	U.S. Environmental Protection Agency, National Training and Operational Technology Center (NTOTC), Office of Water Program Operations	128

Table		Page
I	Ohio Environmental Protection Agency, Office of Air Pollution Control, Current (1976) Staffing by Division	25
II	Ohio Environmental Protection Agency, Office of Air Pollution Control, Current (1976) Staffing Level	26
III	Cleveland Division of Air Pollution Control, Current (1976) Staffing Level	27
IV	Local Air Pollution Control Agencies, Current (1976) Staffing Level	28
V	State of Ohio, Local Air Pollution Control Programs, Current (1976) Staffing Level	30

Table		Page
VI	Ohio Environmental Protection Agency, Office of Air Pollution Control, Workforce Projections to 1982 (est.)	31
VII	Cleveland Division of Air Pollution Control, Workforce Projections to 1982 (est.)	33
VIII	State of Ohio, Municipal Noise Ordinances (1975)	42
IX	Ohio Department of Agriculture, Pesticide Regulation Section, Current (1976) Staffing Level	50
X	Ohio Department of Agriculture, Pesticide Regulation Section, Workforce Projections to 1982 (est.)	57
XI	Ohio Environmental Protection Agency, Office of Public Water Supply, Current (1976) Staffing by Division	66
XII	Ohio Environmental Protection Agency, Office of Public Water Supply, Current (1976) Staffing Level	67
XIII	Ohio Department of Natural Resources, Division of Water, Section on Water Inventory and Water Resource Development, Current (1976) Staffing Level	68
XIV	State of Ohio, Certified Water Treatment Plant and Distribution System Operators, Current (1976) Staffing Level	68
XV	Ohio Environmental Protection Agency, Office of Public Water Supply, Workforce Projections to 1982 (est.)	71
XVI	Ohio Department of Health, Radiological Health Unit, Current (1976) Staffing Level	78
XVII	Ohio Environmental Protection Agency, Office of Land Pollution and Control, Current (1976) Staffing Level	85
XVIII	Ohio Environmental Protection Agency, Office of Land Pollution and Control, Workforce Projections to 1982 (est.)	87

Table		Page
XIX	Ohio Environmental Protection Agency, Office of Wastewater Pollution Control, Current (1976) Staffing by Division	94
XX	Ohio Environmental Protection Agency, Office of Wastewater Pollution Control, Current (1976) Staffing Level	94
XXI	Cleveland Regional Sewer District, Current (1976) Staffing Level of Three Treatment Facilities	95
XXII	Ohio River Valley Sanitation Commission, Current (1976) Staffing Level	98
XXIII	Ohio Operator Training Courses, FY '76 - FY '77	103
XXIV	Ohio Energy and Resource Development Agency, Current (1976) Staffing Level	110
XXV	Ohio Department of Natural Resources, Division of Oil and Gas, Current (1976) Staffing Level	111
XXVI	Ohio Department of Natural Resources, Division of Reclamation, Current (1976) Staffing Level	112
XXVII	U.S. Environmental Protection Agency, Environmental Research Center, Cincinnati, Ohio, Current (1976) Staffing by Division	122
XXVIII	U.S. Environmental Protection Agency, NTOTC, Training Course Attendance, FY 1965 - FY 1977	125

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PREFACE

This report presents existing workforce levels, training programs, and career potentials and develops staffing level projections (1976-1981) based on available information for the State of Ohio in the environmental pollution control areas of air, noise, potable water, pesticides, radiation, solid waste, waste water, and energy. This study was carried out for the United States Environmental Protection Agency by National Field Research Center of Iowa City, Iowa.

The information and data presented in this report were compiled in large part from extensive interviews with professionals working in the respective areas and were supplemented by telephone surveys and research.

FOREWORD

The material herein contains the information and data collected for eight individual pollution control inventories conducted for Ohio. The format includes workforce profiles, projections, growth and career potential for each of the areas investigated. Growth projections are necessarily based on best professional estimates developed from available information and represent what are felt to be realistic figures by experts in the respective areas. The pollution control areas considered by this study are as follows:

Air
Noise
Pesticides
Public Water
Radiation
Solid Waste
Wastewater
Energy

National Environmental Energy Workforce Assessment

Phase I

OHIO

State Summary

I. AIR

As a highly industralized state, Ohio has had to face many air pollution problems. The quantity and variety of air pollutants, particularly in the northeastern part of the state, are perhaps greater in Ohio than in any other state.

The Office of Air Pollution Control of the Ohio Environmental Protection Agency (Ohio EPA) is the state lead agency in air pollution matters and for enforcing state air quality standards. The Air Office has personnel in the five Ohio EPA regional offices, and in addition, there are 12 local air pollution control agencies performing services for Ohio EPA.

A staff of 17 persons currently comprises the Office of Air Pollution Control in its three divisions of Program Development and Review, Technical Support operations, and Field Operations. The local air pollution control programs have a combined staff of 278 persons; engineers and environmental scientists, and enforcement personnel.

The Office of Air Pollution Control is currently understaffed and anticipates significant growth to meet legislative requirements. Recent reorganization and attrition problems have caused some difficulty in program functions. Most local air agencies have reached appropriate staffing levels, although the Cleveland office still expects some growth. Engineers are likely to be in demand in most high-level positions and technicians will be required for enforcement and monitoring activity.

II. NOISE

Ohio currently has no statewide noise control and abatement legislation. Limited noise related activities are carried out by the Department of Transportation (DOT) in highway design and by the Department of Public Health (DPH) under the Occupational Safety and Health Act (OSHA).

DOT employs 30 persons who carry out noise review and analysis as it relates to highway construction and design. Twenty of these are engineers and the remaining ten are engineering technicians. DPH has three engineers and two environmental technicians on staff who are engaged in OSHA monitoring and consulting activities. Staff turnover is very low in both programs.

Growth in the Ohio noise workforce is expected to be minimal, although DOT does see some careers for engineering technicians. Budgetary constraints will also limit growth in the noise area as other pollution problems in the state are felt to be more serious. DOT has contracted some noise analysis work in the past and, depending on its hiring authorizations, may do more of this in the future.

III. PESTICIDES

The State of Ohio was one of the first to require the licensing of commercial applicators in 1970. Licensing of applicators and control of pesticides was brought under tighter control following enactment of the Federal Environmental Pesticide Control Act in 1972.

In Ohio, the state lead agency for pesticide matters is the Department of Agriculture. Specifically, the Pesticide Regulation Section with the Division of Plant Industry is responsible for pesticide programs. The Ohio State University Cooperative Extension Service assists in applicator training and Ohio Agricultural Research and Development Center conducts extensive pesticide research and testing.

Four persons staff the Pesticide Regulation Section, including two entomologists and one agronomist. Seventeen professionals are currently active in applicator training although this is not their primary responsibility; common professions include plant pathologists, entomologists and horticulturists. The Research and Development Center has a staff of 879 employees, a significant portion of whom devote some effort to pesticide matters.

The Pesticide Regulation Section predicts that substantial workforce growth will be needed for applicator certification and enforcement activities. Among commercial and private applicators a maximum growth rate of 5% is expected.

IV. POTABLE WATER

Provision of a safe water supply to Ohio's 10.7 million population, along with their numerous business and industries, is a major undertaking. There are over 20,000 public water supplies in the state.

The Office of Public Water Supply within the Ohio Environmental Protection Agency is the state lead agency in potable water matters. The Office is divided into four divisions: Facilities and Operations, Water Quality, Engineering, and Groundwater. A total of 30 persons staff the Office, 13 in Columbus and the remainder in the five state EPA district offices. Twenty of the positions are filled by engineers, usually sanitary or civil; geologists represent the second most common professional category. The Division of Water of the Ohio Department of Natural Resources employs approximately 29 people in water supply matters with geology the most common profession. There are approximately 2,500 water treatment and distribution operator personnel in the state.

Dramatic growth is expected in the potable water field in Ohio, largely as a result of the Safe Drinking Water Act mandates. The Office of Public Water Supply expects to more than triple the number of engineers on staff. Some openings for technicians and a 20% increase in the number of operating personnel are among other projections.

V. RADIATION

Environmentally-related radiation matters in Ohio are the responsibility of the Radiological Health Unit within the State Department of Health. The Unit must enforce radiation standards and control isotopes and radiators when these matters are not handled by the Nuclear Regulatory Commission.

The Radiological Health Unit has a staff of five professionals and one clerical. Four of the professional staff are engineers and the other professional is an engineer. In the private sector there are an estimated 350-400 safety officers involved in some aspect of radiation control.

Workforce for the Unit may be expanded by from two to fifteen positions, depending on the fate of a proposed radiation source licensing law. Most openings are expected to be for radiological health physicists, and the career outlook in this area is considered bright.

The career picture is enhanced by the development of nuclear power facilities in the state. Ohio currently has no nuclear power plants, but three nuclear power complexes with a total of seven units are scheduled to be in operation over the next ten years. The demand for persons with radiological health physics training is treater than the supply; unless more education programs are developed, the situation will probably worsen.

VI. SOLID WASTE

Each year in Ohio more than seven million tons of municipal solid waste are discarded. Surveys indicate that Ohio leads the nation in toxic and hazardous wastes being generated and disposed of without adequate control.

The state lead agency in solid waste and land pollution matters in the Office of Land Pollution Control within the Ohio Environmental Protection Agency. The Office is operated through three Divisions: Solid Waste Management, Hazardous Waste Control, and Program Planning. There is currently a staff of 12 professionals, half of whom are sanitarians and the remainder being engineers and scientists.

The Office of Land Pollution Control is in the midst of major workforce changes. The staffing level has declined from 24 employees with 14 additional authorized positions in May of 1975 to its present level. However, with appropriate funding, the Office anticipates growth to 31 professional and two clerical positions by 1982. Much of the growth is expected as a result of the Resource Conservation and Recovery Act and will be for positions in District Offices.

Greater supervision and specialized treatment of hazardous wastes and nuclear reactor waste will provide many solid waste career opportunities. Additional planning activities will account for part of the growth.

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VII. WASTEWATER

Wastewater and water pollution control activities in Ohio have taken on growing importance in recent years in an effort to protect the state's water resources. Ohio's industrial facilities, particularly in the northeastern part of the state, present many unique water pollution problems.

Ohio Environmental Protection Agency's Office of Wastewater Pollution Control has primary responsibility for water pollution matters. The Office has a staff of 124 persons in its six divisions and district offices. Of the 55 people in the Columbus office, engineers, chemists and biologists are the most common occupational category. There are approximately 1,640 certified wastewater operators in the state, and additional local workforce can be found in significant numbers in cities such as Cleveland.

Workforce projections for this office were extremely hard to make because of funding difficulties experienced throughout Ohio EPA. Staff reduction of approximately 25% has occurred in 1975-1976, but significant growth is expected to fulfill legislation. Construction grant activities will require more civil engineers and more technically trained personnel. Persons with wastewater and water pollution experience will be most sought after.

Less growth is expected at the local operator level because Ohio's early activity in this area has filled most needs.

VIII. ENERGY

Energy uses and shortages are taking on increased importance at both the national and state levels. Ohio has a number of energy resources, is a major energy user, and has three state agencies active in the field.

The Ohio Energy and Resource Development Agency (ERDA) coordinates research, allocation and financing programs with a staff of 26 persons. Nearly half of the staff are planners and administrators, a fact which shows the policy-making role of the agency. In the Department of Natural Resources, the Division of Oil and Gas and the Division of Reclamation have a major energy role. The Division of Oil and Gas has a staff of 24 with 15 being field inspectors. Experience in oil or gas production is the main criterion for inspectors. The Division of Reclamation has a staff of 43 which includes 17 inspectors; training in geology, forestry, and agronomy are most common.

Significant growth is expected in the Division of Oil and Gas and the Division of Reclamation as energy production takes on new importance. Use of Ohio coal and more drilling operations will increase the need for inspectors in both of these Divisions. Because of the commercial attractiveness of energy production and research, significant workforce growth in the private sector can also be expected.

STATE OF OHIO - SUMMARY

National Environmental/Energy Workforce Assessment
Pollution Control & Abatement Personnel
Projected Workforce Requirements (1976-1981)

Environmental Area	1976	1977	1978	1979	1980	1981	%/annum growth (average)
AIR[1]	71	71	79	82	89	93	6%
NOISE[2]	35	35	38	41	44	47	6%
PESTICIDES[3]	4	8	8	8	11	11	38%
POTABLE WATER[4]	30	50	55	60	76	86	25%
RADIATION[5]	5	5	6	6	7	7	7%
SOLID WASTE[6]	12	15	24	30	31	31	23%
WASTEWATER[7]	55	63	72	82	84	96	15%
ENERGY[8]	93	107	112	114	116	118	5%
TOTALS	305	354	394	423	458	489	10%

1) Does not include 278 positions in local air agencies for which little growth is expected.

2) Includes combined Department of Health and Department of Transportation positions; does not include local enforcement personnel.

3) Includes only Pesticide Regulation Section personnel; does not include approximately 3,000 commercial applicators and 20,000 farmers who may be certified but for which few growth rate figures are available.

4) Does not include 29 ODNR positions or approximately 2,500 operator personnel.

5) Does not include local or private health safety personnel numbering from 350 to 400.

6) Does not include local collection and disposal personnel.

7) Does not include approximately 1,640 wastewater plant operators, 27 ORSANCO positions, and numerous other local personnel.

8) Includes combined totals for Ohio ERDA, and ODNR Division of Oil and Gas and Division of Reclamation.

EDUCATION

A large number of environmentally-related education programs have been developed and are now being offered by Ohio's higher education institutions. Programs are being offered in all areas in all parts of the state and can be partially attributed to the critical environmental pollution problems facing Ohio.

Two-year institutions offering environmental programs include Muskingum Area Technical College, Hocking Technical College, Lorain County Community College, Jefferson County Technical Institute, and many others. Examples of programs are Environmental Health Technology, Environmental Engineering Technology, Natural Resources Conservation Technology, and Petroleum Engineering Technology.

At the four-year level Cleveland State University, Miami University, John Carroll University, Ohio State University, and the University of Cincinnati are some of the colleges with environmental programs. Curricula focus on such areas as environmental sciences, ecology, pesticides, environmental health, environmental engineering, and environmental medicine.

LEGISLATION

The environmental/energy legislation for Ohio was obtained by request from various agency personnel and through various library references. Summaries of the legislation deemed most relevant to the eight subject areas of the workforce assessment were prepared, and are included in the respective state reports. The following list of laws represents virtually all environmental legislation for the state. Only certain of the following laws were summarized; the list is presented to show, by title, the kinds of laws which have been enacted.

Environmental Protection Agency Act
Air Pollution Control Law
Noise and/or Air Pollution Control Facility Law
Economic Poisons and Devices Law
Pesticide Use and Application Law
Radiation Protection Law
Solid Waste Disposal Law
Water Pollution Control Act
Water Development Authority Act
Watercraft Sewage Disposal and Navigation Law
Power Siting Laws
Strip Mine Law
Energy and Resource Development Agency Law

National Environmental Energy Workforce Assessment

Phase I

OHIO

State Report

13

STATE PROFILE

The location of Ohio, perhaps more than anything else, has contributed to its growth as a population and industrial center. Ohio lies close to major resources of raw materials and is easily accessible to the markets of the East, South, and Midwest. As a result Ohio ranks sixth in population with 10,743,000 inhabitants even though it is one of the smallest states west of the Appalachian Mountains. The population density of 260 persons per square mile is one of the highest in the country.

Ohio's industrial structure was firmly established between 1850 and 1880 as a result of the stimulus provided by the Civil War. Economic growth continued and was particularly prominent in the northeastern part of the state around Cleveland. The result was that Ohio became one of the first great industrial states in the nation.

The Ohio economy is based on a very unique and desirable balance among agriculture, mineral production, and manufacturing. More than 60 per cent of Ohio is still used as farmland, and even though it is 35th in size it ranks in the top ten states nationally in 20 different types of crops produced. Included in this list of crops are such diverse items as corn, oats, tomatoes, apples, wheat, tobacco and popcorn. Ohio is also a large producer of beef, pork, lamb and poultry products.

A great deal of Ohio's mineral production has been in the form of coal from the eastern and southeastern counties. Strip mining of this coal has been a major industry in these areas, but it has unfortunately resulted in a scarred landscape, polluted water supplies, and a generally damaged environment. Recent discoveries of oil and natural gas have revived what was once a major industry and eased energy problems for much of the state. Other minerals of significance found in Ohio are limestone, sandstone, salt and ceramic clay.

Manufacturing employs more people in Ohio than any other economic activity. The largest industries are non-electrical machinery, automobiles, and aircraft. Ohio is among the leaders in nearly all industrial classifications, and leads all states in the manufacture of such products as rubber, porcelain ware, electrical machinery, pumps, and plumbing equipment.

Two major geographical features of Ohio are the Ohio River which stretches along the eastern and southern borders and Lake Erie on the northern border; these have served excellently as transportation, water, and power resources. There are three main physiographic regions in Ohio: the Allegheny Plateau in the south and east; the Lake Plains along Lake Erie to the northwest; and the Central Plains in the central and western portions.

Northern Ohio is dominated by the Cleveland-Akron-Youngstown industrial and financial area in the east. Toledo is the population center in the more agricultural west. Cincinnati and Dayton are manufacturing centers for southwestern Ohio; southeastern Ohio is, by comparison, sparsely populated. Government and educational institutions are dominant in central Ohio around Columbus.

Concentrated population centers, heavy industries, and the need for more energy sources have created a composite of many national environmental problems in Ohio. Northern Ohio is already being considered as part of an urban agglomeration stretching from Buffalo, New York to Chicago. Dense population and heavy industry have created monumental water pollution problems, particularly in the Cuyahoga River and Lake Erie. Strip mining has left millions of acres of land unreclaimed and barren in the southeast. A need for renewed use of Ohio's vast coal reserves may trigger new air pollution problems.

Ohio will continue to reflect the national situation in environment and energy fields. Its coal, oil and gas reserves will continue to be relied on, industrial growth is likely to continue, and the need for persons trained to protect the environment will go hand-in-hand with these developments.

OHIO POLLUTION CONTROL AND ABATEMENT AGENCIES

In Ohio there are five statewide agencies involved in pollution control and abatement. Foremost among these agencies is the Ohio Environmental Protection Agency; others of importance are the Energy and Resource Development Agency, the Department of Agriculture, the Department of Health, and the Department of Natural Resources.

The Ohio Environmental Protection Agency (Ohio EPA) is headquartered in Columbus, Ohio, with five district offices throughout the state. The bulk of the agency personnel are located in the Columbus office. Four offices within Ohio EPA are responsible for pollution control and abatement activities: Office of Land Pollution Control, Office of Public Water Supply, Office of Wastewater Pollution Control, and Office of Air Pollution Control.

The administrative efforts of Ohio EPA are carried out by three offices which include the executive office, the Office of Operational Support, and the Office of District Operations. The executive section contains not only the Director's and Assistant Director's offices, but also the Legislative Liaison, the Legal Advisor, Emergency Response, the Public Interest Center, and the Planning Coordinator.

As of August 1976, Ohio EPA was staffed by 374 full-time permanent employees. In addition the agency had 31 CETA and 30 Title X employees who bring the grand total to 435 persons. In mid-1975 Ohio EPA was reorganized with significant impact on staffing levels. The effects of this reorganization will be discussed in the sections dealing with particular programs.

The Ohio Energy and Resource Development Agency (Ohio ERDA) is a relatively new agency, having been organized in 1975 in response to growing concerns with energy problems in this country. The main efforts of Ohio ERDA are directed at making greater use of Ohio energy resources such as gas and coal, and at bringing about the most efficient allocation and conservation of all energy resources.

Ohio ERDA is divided into the four sections of the Director's office, Research and Development, Policy and Planning, and Bonding and Administrative Services. As of August 1976, there were 26 full-time persons on staff and 10 authorized positions were vacant.

The Ohio Department of Agriculture is the state lead agency in the area of pesticide use and control; responsibility for this area is in the Section on Pesticide Regulation within the Division of Plant Industry. Basic responsibilities of the Section include: licensing of commercial applicators; registration and analysis of pesticides; and investigation of pesticide accidents and incidents.

The Section on Pesticide Regulation is presently staffed by seven persons. Four of these persons are employed in the Columbus office and three are inspectors working throughout the state.

A fourth agency involved in pollution control and abatement is the Ohio Department of Health. Radiation control activities are centered in the Division of Technical Environmental Health Services within the Bureau of Environmental Health. Major activities of this Division are the enforcement of radiation standards and the control of isotopes and radiators in those areas not covered by the Nuclear Regulatory Commission.

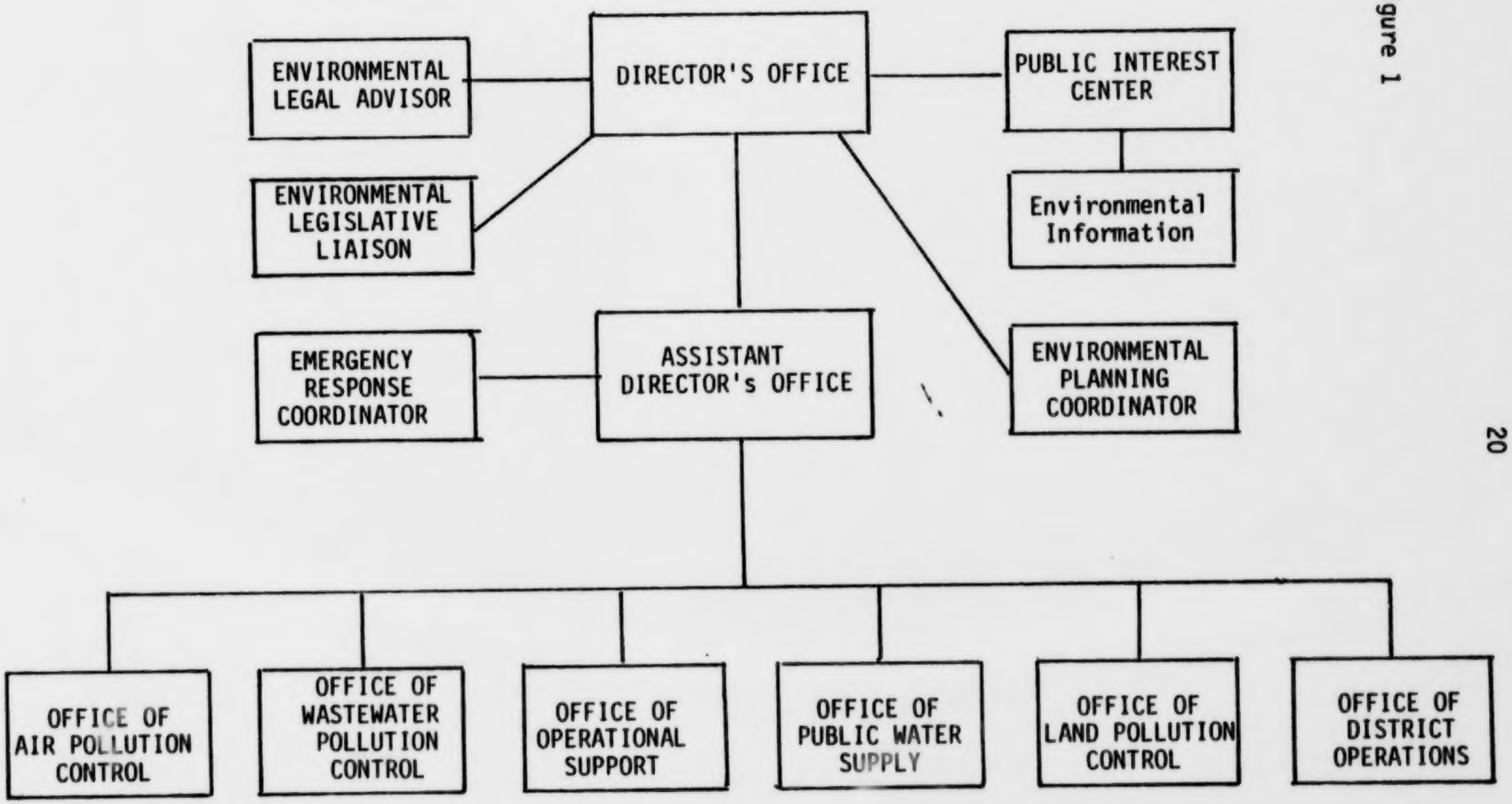
In August 1976 there was a staff of six full-time and one part-time person in the Division's Radiological Health Unit performing the enforcement and control functions; there was one vacancy in the Unit.

Certain divisions of the Ohio Department of Natural Resources (Ohio DNR) are also very active in the pollution control and abatement area. Of eleven divisions within Ohio DNR, those most involved in this area are Reclamation, Oil and Gas, Water, and Soil and Water Districts. The functions and responsibilities of each division will be discussed in those sections dealing with particular pollution control programs.

While there are approximately 2,500 people employed in Ohio DNR, only about 200 of these are in the four divisions with major environmental activities. The numbers and disciplines involved in environmental areas of water, energy and land pollution will be discussed in those sections of the report.

Figure 1

OHIO ENVIRONMENTAL PROTECTION AGENCY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OFFICE OF WASTEWATER POLLUTION CONTROL
OFFICE OF OPERATIONAL SUPPORT
OFFICE OF PUBLIC WATER SUPPLY
OFFICE OF LAND POLLUTION CONTROL
OFFICE OF DISTRICT OPERATIONS

Pollution Control and Abatement Programs

I. AIR

A. Introduction

Ohio is a heavily populated, highly industrialized state. According to State Implementation Plan data there are 934 facilities in Ohio capable of emitting over one hundred tons of a pollutant each year. There are a large number of steel, automobile and rubber plants in Ohio, generally concentrated in the northeast Cleveland-Akron-Youngstown-Steubenville area; Ohio leads the nation in rubber production and ranks second only to Michigan in the size of its automotive industry.

In the Cleveland area all of the six major air pollutants (particulates, sulfur dioxide, carbon monoxide, hydrocarbons, nitrogen oxides and photochemical oxidants) are present in large quantities in the atmosphere. Steel mills, utility companies, and refuse-burning equipment are the main contributors to the 76,000 tons of particulates and 139,000 tons of sulfur dioxides which enter the Cuyahoga County air each year. In the Cincinnati area suspended particulate matter and photochemical oxidants, largely from automobile emissions, are the main sources of air pollution. Other areas of the state have similar air pollution problems but on a smaller scale. As a result, there has been a need for a great deal of activity in the air pollution control field in Ohio.

The original air pollution control law for the state became effective in 1967; it was significantly revised in 1971 following the federal changes in the Clean Air Act Amendments of 1970. Key provisions of the Ohio law require the Ohio Environmental Protection Agency (Ohio EPA) to:

1) Develop programs for the prevention, control, and abatement of air pollution;
2) Issue regulations for the control of air pollution and the establishment of ambient air quality standards;
3) Establish state emission standards for air contaminants;
4) Develop means of attaining and maintaining ambient air quality standards;
5) Establish, operate, and maintain monitoring stations and other devices to measure air pollution.

The Office of Air Pollution Control of the Ohio EPA is generally responsible for enforcement of act provisions and oversees the regulation and control of air pollution. As part of the State Implementation Plan to control air pollution, the Office administers a permit program for stationary emission sources. Under the program a permit to operate is issued when a source is meeting all regulations; a variance is issued when a source is not meeting requirements but is on a compliance schedule; and a permit to install when a new source is to be constructed. Totals under the stationary permit program show the issuance of 47,000 permits to operated, 3400 variances, and 800 permits to install.

Structurally the Office of Air Pollution Control is composed of three divisions. The Division of Technical Support Operations provides engineering and technical services for air programs and develops guidelines to be followed by field operations staff in dealing with applications for permits or variances, plant inspections, complaint investigations, air sampling and other technical operations. The Division maintains air quality and pollutant emission records, and prepares engineering evaluations for the Ohio Air Quality Development Authority.

The Division of Program Development and Review is responsible for periodic assessment of the effectiveness of air pollution control programs and for the preparation of the comprehensive air pollution control strategy. Additionally, this Division analyzes the air quality effects of various pollution sources and works with other Divisions of the Office to implement air pollution control efforts.

The Division of Field Operations is the other section of the Office of Air Pollution Control. This Division is responsible for coordinating and integrating all aspects of the work of twelve local air pollution agencies and five Ohio EPA District offices into a state-wide air pollution control program. The Division must assure that all district offices and local agencies are aware of current program activities and are capable of performing their functions. Other functions of this Division include the processing of all types of air permits, monitoring of permits and variances which have been issued, and operating a network of air sampling and observation stations.

As noted above, the air program does have employees at each of the five Ohio EPA District Offices. In addition, because of the massiveness of the Ohio air pollution control effort, Ohio EPA has contracted with twelve local air agencies to perform monitoring and surveillance activities. These agencies are located in the following cities: Akron, Canton, Cincinnati, Cleveland, Dayton, Lorain, Mansfield, Painesville, Portsmouth, Steubenville, Toledo, and Youngstown.

B. Workforce Profile

The Office of Air Pollution Control, through Ohio EPA, has authority to promulgate various regulations. The purpose of the Office and the regulations is perhaps best stated in Regulation AP-2-202:

> To set forth such requirements as shall be necessary to secure and maintain those levels of air quality which are consistent with the protection of health and the prevention of injury to plant, animal life, and property of the State of Ohio, and to provide for the comfortable enjoyment of the natural attractions of the State to the greatest extent practical.

It is in support of this goal that the three Divisions of the Office have been staffed and perform their various functions. There are currently seventeen people employed in the Office of Air Pollution Control in Columbus and an additional thirty-seven people at the five district offices throughout the state. By Division, the Columbus personnel are distributed as follows:

TABLE I

OHIO ENVIRONMENTAL PROTECTION AGENCY

Office of Air Pollution Control
Current (1976) Staffing by Division

Division	1976
Administrative	2
Program Development & Review	2
Technical Support Operations	10
Field Operations	3
TOTAL	17

There are also six temporary CETA positions filled in the main office. The staffing level of the Office of Air Pollution Control by occupational category is shown on the following table.

TABLE II

OHIO ENVIRONMENTAL PROTECTION AGENCY

Office of Air Pollution Control
Current (1976) Staffing Level

Position	1976
Engineer	6
Environmental Scientist	4
Technician	1
Administrator	3
Clerical	3
TOTAL	17

By discipline, the key positions shown in the above table are engineers and environmental scientists. The engineers have a variety of training backgrounds including civil engineering and public planning. Most of the environmental scientists have a background in either physical science or environmental health.

The largest, in terms of workforce, of the twelve local air agencies is the Cleveland Division of Air Pollution Control. With a 1976 staffing level of eighty-seven persons, this Division is substantially larger than the Ohio EPA Office of Air Pollution Control. The staff includes fifty-three permanent full-time positions, thirty-two Title X positions, and two CETA positions. The following table represents a breakdown of the staff by job classification.

TABLE III

CLEVELAND DIVISION OF AIR POLLUTION CONTROL

Current (1976) Staffing Level

Position	1976
Engineer	17
Chemist	20
Technician	21
Attorney	2
Administrator	20
Clerical	7
TOTAL	87

Most personnel noted in the above table have a strong technical, job-related background, even in administrative positions. The technicians are required to have a degree in one of the physical sciences; they are generally located in the Bureau of Field Services and perform monitoring and surveillance activities. The chemists are also classified as Laboratory Technicians or Assistants and fill positions in the Bureau of Technical Services.

The Cleveland Division of Air Pollution Control is under annual contract with Ohio EPA to carry out certain functions in Cuyahoga County. These activities include taking air samples, answering complaints, enforcing permits, and performing other duties as requested.

There are eleven other local air pollution control agencies under contract with Ohio EPA and performing many of the same functions as the Cleveland agency. The staffing levels and occupational classifications for these agencies are set forth in the following table.

TABLE IV

LOCAL AIR POLLUTION CONTROL AGENCIES

Current (1976) Staffing Level

Agency		1976
AKRON AIR POLLUTION CONTROL		9
Engineer	3	
Chemist	2	
Biologist	2	
Environmental Scientist	1	
Natural Scientist	1	
CANTON AIR POLLUTION CONTROL DIVISION		13
Engineer	3	
Chemist	1	
Lab Technician	2	
Inspector	5	
Clerical	2	
CINCINNATI DIVISION OF AIR POLLUTION CONTROL		57
Engineer	9	
Chemist	4	
Technician	9	
Inspector	23	
Administrative & Clerical	12	
DAYTON REGIONAL AIR POLLUTION CONTROL AGENCY		45
Engineer	2	
Scientist	16	
Enforcement	8	
Technician	3	
Planner	1	
Administrative	6	
Clerical	9	
LORAIN DEPARTMENT OF POLLUTION CONTROL		6
Engineer	1	
Technician	2	
Enforcement	1	
Administrative & Clerical	2	

LOCAL AIR POLLUTION CONTROL AGENCIES (CONT.)

Agency		1976
MANSFIELD-RICHLAND COUNTY HEALTH DEPARTMENT		2
Technician	2	
PAINESVILLE-LAKE COUNTY COMBINED GENERAL HEALTH DISTRICT		6
Engineer	1	
Technician	1	
Enforcement	2	
Administrative & Clerical	2	
PORTSMOUTH CITY HEALTH DEPARTMENT		8
Engineer	1	
Technician	3	
Enforcement	2	
Administrative & Clerical	2	
STEUBENVILLE-NORTH OHIO VALLEY AIR AUTHORITY		17
Engineer	3	
Technician	6	
Enforcement	4	
Administrative & Clerical	4	
TOLEDO POLLUTION CONTROL AGENCY		19
Engineer	3	
Technician	4	
Enforcement	5	
Administrative & Clerical	7	
YOUNGSTOWN-MAHONING-TRUMBULL AIR POLLUTION CONTROL AGENCY		9
Engineer	2	
Technician	3	
Enforcement	2	
Administrative & Clerical	2	
	TOTAL	191

When the information from the preceding table is combined with that from the local Cleveland agency, it is shown that a total of 278 persons staff the Ohio local air agencies. The 54 in Ohio EPA offices and the 278 in local air pollution control agencies then show a total public sector workforce in Ohio air programs of 332 employees. The above table and the table for the Cleveland Division of Air Pollution Control can be combined to show a total occupational category breakdown for the local agencies.

TABLE V

STATE OF OHIO

Local Air Pollution Control Programs
Current (1976) Staffing Level

Position	1976
Engineer	35
Technician	56
Scientist	47
Enforcement	52
Administrative & Clerical	75
Other	13
TOTAL	278

Engineers for local agencies are generally chemical engineers or have some air pollution training. The administrators noted in the above table often have science or engineering training. The enforcement personnel in the various agencies engage in monitoring and surveillance, operation of air sampling stations and, in some agencies, the actual issuing of citations. The technicians are usually involved in monitoring or laboratory activities. In some cases, the workforce at the local level is made up of an equivalency figure of part-time or shared personnel.

In both the state and local offices, recruiting and hiring are done through a merit commission or its equivalent. However, because of the specialized and technical nature of many positions recruitment efforts are also directed toward colleges and technical institutions.

C. Workforce Projections

Workforce projections for this portion of the report were made by personnel in Ohio EPA and local air pollution control agencies. In many instances these projections represent best professional judgements, and an effort has been made to consider optimum planning figures and what is often more "realistic" figures considering budget limitations.

Ohio is largely an urban, industrial state and largely because of this it faces and will continue to face numerous air pollution problems. Because of recent staff reductions and future agency goals, the Ohio EPA Office of Air Pollution Control anticipates moderate growth over the next five years. Budget limitations may affect the actual growth, but they will not affect the need for trained personnel.

TABLE VI
OHIO ENVIRONMENTAL PROTECTION AGENCY
Office of Air Pollution Control
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	6	6	9	10	12	14	n/a	20%
Env. Scientist	4	4	6	7	10	11	n/a	24%
Technician	1	1	3	3	5	6	n/a	57%
Administrator	3	3	4	4	4	4	n/a	7%
Clerical	3	3	3	4	4	4	n/a	7%
TOTAL	17	17	25	28	35	39		19%

Workforce projections and turnover rates for this office are extremely difficult to measure. There has been approximately a 25 percent attrition since mid-1975, but virtually none of these persons have been replaced; presently the office is critically understaffed and backlogs are developing. By some projections it would require a staff approximately four times as large as that now employed; this would entail a staff of approximately sixty-eight persons with the growth being spread over all types of positions.

The projections shown in the above table are for the Columbus office only and would more than double its size. An attempt was made to estimate growth rates for particular positions based on personnel which has been lost and expressed needs in individual classifications. No attempt has been made to determine the actual probability of positions being filled in these numbers nor the percentage of office functions which could be performed by this size of staff.

Provided budget limitations can be overcome, substantial growth in the Office of Air Pollution Control is likely to occur. Planning figures for fiscal years 1978 and 1979 show a need for 277 employee equivalents to accomplish 100 percent of office objectives; this optimum level translates to over 138 people per year.

In the Cleveland Division of Air Pollution Control, the largest local air agency in the state, continued growth is anticipated. The personnel level has risen from 70 in 1975 to 87 in 1976; by 1977 a staff of 95 is expected and by 1978 the staff may be as large as 120 persons. While this growth will be in all agency occupations, most of it is likely to occur in the legal, technician, and data processing fields.

TABLE VII

CLEVELAND DIVISION OF AIR POLLUTION CONTROL

Position	Workforce Projections to 1982 (est.) 1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	17	18	24	24	25	25	n/a	9%
Chemist	20	21	23	23	23	23	n/a	3%
Technician	21	23	32	33	35	37	n/a	13%
Attorney	2	4	6	6	6	7	n/a	33%
Administrator	20	20	23	23	23	23	n/a	3%
Data Processor	0	2	4	5	5	6	n/a	69%
Clerical	7	7	8	8	8	9	n/a	5%
	87	95	120	122	125	130		9%

The turnover rate for the Cleveland agency has been approximately 24 percent for the past two years; the problem created by this is compounded because most turnover is in the upper-level professional classifications. This is attributed in large part to the salary structure at these levels. Efforts are being made to improve salaries and reduce the turnover rate.

Part of the growth anticipated for technicians in the above table is a result of the need for weekend and 24-hour crews to monitor air pollution problems and enforce regulations. The data processing growth, estimated at this time, will result from increased use of computers and more technical data-gathering equipment.

The Cincinnati Division of Air Pollution Control, the second-largest such agency in Ohio, has experienced less turnover and anticipates less growth than the Cleveland office. Although program operations are increasing, budget limitations and a 4 percent annual attrition rate have reduced the staff by 20 percent over the past five years. The Division had 69 people on staff in 1974 and currently employs 57.

Further staff cuts are expected as the level of funding remains constant and no adjustment is made for inflation or other factors.

Workforce projections for the ten other local air agencies indicate very limited staff growth. Most agencies have grown substantially in the past three to five years as permit systems and other activities were expanded under the State Implementation Plan. As more sources come into compliance, there is a general feeling that employment levels will be maintained but very little growth is likely. The expansion which does occur will be to handle a larger planning function or to deal with specific local problems.

D. Training and Certification

The same budget restrictions that have limited staff expansion have also hampered continued staff training opportunities. Office of Air Pollution Control personnel formerly have been trained at Research Park in North Carolina, but restrictions on out-of-state travel have virtually eliminated this practice. An interest in similar EPA-sponsored training within Ohio was noted. The lack of formal educational facilities for most office duties results in a great deal of on-the-job training. A good deal of technical expertise is essential for planning overall strategies and providing technical assistance; OJT is often the only way to obtain this.

Cleveland and other local agencies have had to curtail most formal upgrade training because of the expense involved. For the Cleveland Division the problem has been solved at least in part by carrying out its own training programs. Smoke readers must be certified every six months, usually at the Division's own smoke reading school. An in-house educational session for particulate and gas problems is also conducted. Other agency and industry personnel are invited to participate in most training sessions.

Generally a need was expressed for more local and in-state upgrade training options. The inability to send staff personnel to formal training centers may eventually affect the quality of the air pollution control effort. The extensive use of on-the-job training also indicates a shortage of formal training opportunities in specific air pollution matters.

E. Career Potential

The career potential in Ohio air pollution control fields appears to be expanding. This is due in part to the need for more surveillance and monitoring (although much of this may be done automatically), the prospects of using more of Ohio's high-sulfur coal, and the general automobile and industrial pollution problems in urban areas. With increasing use of automatic and complex monitoring equipment, there is likely to be a demand for persons capable of using and maintaining this equipment.

Moderate growth is expected in the state EPA offices and in the Cleveland air pollution control office. The need for trained professionals and engineers will be greater than the general growth because of high turnover rates. More job needs may be filled by technicians with a lower salary structure; in this manner the staff can be expanded more than would be possible recruiting highly-skilled professionals.

On the local level career expansion will be more limited as most compliance and permit activities under the Clean Air Act Amendments of 1970 are on schedule. Additional legislative requirements may have a career impact throughout public sector air agencies that cannot be determined at the present time.

F. Conclusion

Staffing of most air pollution control positions is by engineers, scientists, technicians and other highly-skilled persons. The career potential for these and similar careers would appear to be very bright if it were not for budget limitations which seem common throughout Ohio's public sector.

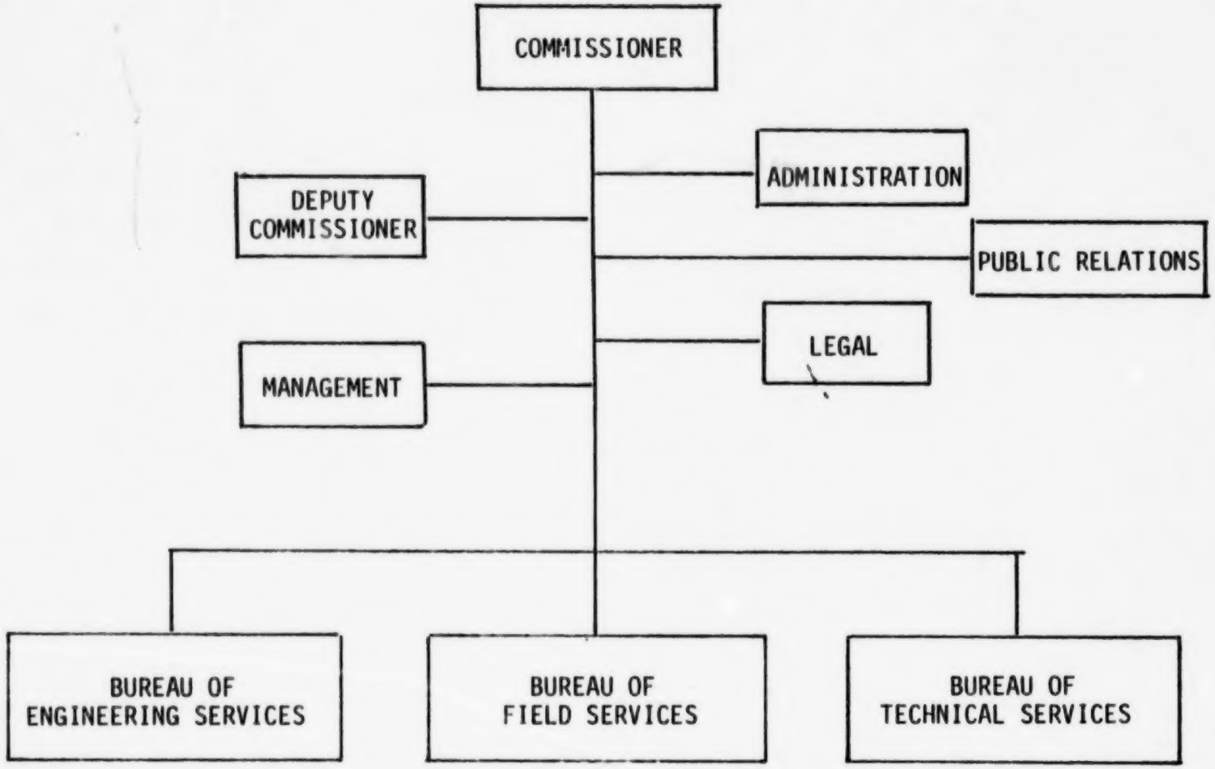
Turnover rates in upper-level positions have created recruitment and hiring problems not necessarily consistent with growth projections. There is some concern about whether all formal training is as strongly tied to job roles as it could be; extensive on-the-job training has been the normal result. Part of this problem could be alleviated if agencies had the financial resources to send personnel to U.S. EPA and other training sessions.

It appears that agency growth--which has been common at the local level in the past five years--will be stabilizing and an attempt will be made to maintain present staff levels. Local agencies will require personnel mainly as a result of turnover. Ohio's critical air pollution problems and future legislative mandates could affect present and future workforce needs.

Figure 2

CITY OF CLEVELAND

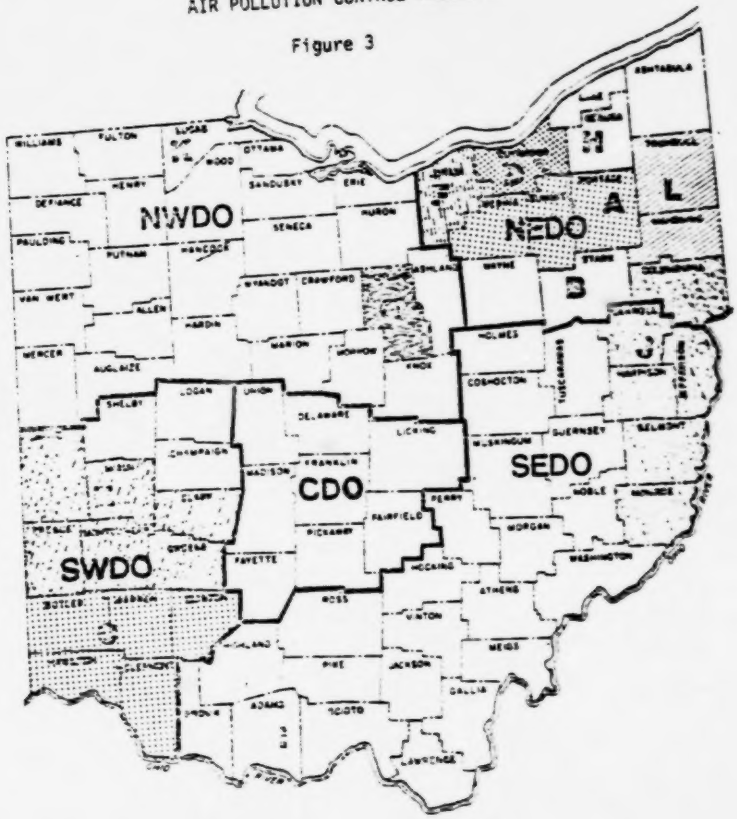
DIVISION OF AIR POLLUTION CONTROL


COMMISSIONER
ADMINISTRATION
DEPUTY COMMISSIONER
PUBLIC RELATIONS
LEGAL
MANAGEMENT
BUREAU OF ENGINEERING SERVICES
BUREAU OF FIELD SERVICES
BUREAU OF TECHNICAL SERVICES

OHIO ENVIRONMENTAL PROTECTION AGENCY

AIR POLLUTION CONTROL PROGRAMS

Figure 3


NWDO
NEDO
CDO
SEDO
SWDO
M
A
L
B
J

LOCAL AIR POLLUTION CONTROL AGENCIES

OhioEPA DISTRICT OFFICES

II. NOISE

A. Introduction

In the State of Ohio, noise pollution control and abatement programs have not been considered a high environmental program priority. Until recent years, few programs were operated which addressed the issue of environmental noise control. There is currently no state legislation which specifies either the regulation or monitoring of noise. Ohio presently has no formal statewide program for noise monitoring and control.

Two state agencies, the Ohio Department of Trasnportation and the Ohio Department of Public Health, have minor noise related activities associated with their existing programs. The Ohio Department of Public Health has a continuing interest in industrial hygiene. This interest has been generated somewhat as a consequence of the Federal Occupational Safety and Health Act of 1970 (OSHA). The Ohio Department of Public Health administers the OSHA-related regulations. The principal focus of the agency's OSHA activities is upon "prevention of death, illness or health impairments resulting from exposure to hazardous agents in occupation situations". However, one component of OSHA concerns the monitoring of internal industrial plant noise. Recent publicity regarding OSHA related programs has increased public awareness of industrial and environmental noise problems and concerns.

The Ohio Department of Public Health is responsible for performance of industrial noise surveys. These are usually conducted by the department upon an invitation basis. The department publicizes its service through newsletters and direct correspondence with industry. The thrust of the service is to assist industry in determining whether it is in compliance with the federal OSHA standards. The department performs an average of five industrial surveys annually. On occasion the department will perform a community noise survey; approximately one survey is conducted annually. The department has not been involved with providing technical assistance to communities interested in developing local noise ordinances or programs. In general, any community requesting assistance is referred to the U.S. Environmental Protection Agency's Regional Office.

The Ohio Department of Transportation administers a noise program associated with the Federal-Aid Highway Act of 1970. The regulations of the Act require the assessment of highway noise impacts relative to ambient levels and "design noise levels". In situations where the noise impacts are severe or the design noise levels are exceeded, noise abatement measures must be considered to lessen the impact or reduce the traffic noise levels to or below the design noise levels. These abatement measures may be in the form of noise barriers, soundproofing and/or air conditioning, or the acquisition of certain affected property. Presently, the Ohio Department of Transportation is considering the construction of noise barriers of different types to reduce the impact of highway-related noise.

B. Workforce Profile

The Ohio Department of Public Health currently employs five persons whose responsibilities include OSHA noise consultation activities. Three of the persons have backgrounds in engineering, and the remaining two staff members are environmental technicians. While the major responsibilities of these five staff persons are concentrated upon OSHA-related monitoring and consulting activities, they have been providing technical assistance to industries in evaluation of external and internal noise levels. When an industry is identified as having a particular noise problem, the Department provides recommendations for and assistance in alleviating the problem. It is estimated that the Department has devoted a maximum of 5 percent of staff time to noise monitoring activities. Turnover within the Department is relatively low, averaging no more than 5 percent annually. The Department recruits through advertising in professional journals and through personal interviews.

The Traffic Noise Control Program of the Department of Transportation is staffed with approximately 30 persons whose responsibilities include reviewing and processing of noise analyses. These persons are located both in the central office in Columbus and in the twelve field offices. Of the 30 staff members, 20 are engineers and ten are engineering technicians. For the most part, the engineering technicians are actively pursuing degrees in engineering during their employment with the department. Turnover in the department averages 0-5 percent annually for engineers and 5-10 percent annually for engineering technicians. The relatively stable turnover is a reflection of the congenial working conditions and the competitive salary structures. Vacancies are recruited through the state and department personnel offices. The personnel offices recruit through local universities and colleges.

The Department of Transportation has contracted with an average of 50 to 60 technical consultants during the last year. The primary production of noise analyses has been assigned to consultants on a project-by-project basis, although some in-house analyses have been produced. The consultants are generally engineers with backgrounds in both planning and design.

As with the state, the municipalities and private industries have relatively few industrial/environmental noise control and abatement programs. There are currently 11 cities in Ohio which have some form of noise ordinance. The following table depicts the type of noise ordinances which the cities have.

TABLE VIII

STATE OF OHIO

Municipal Noise Ordinances (1975)

City	Nuisance	Zoning	Vehicle	Aircraft	Building	Const. Vehicle	Rec. Vehicle
Akron	0						
Amherst	0						0
Cincinnati	0		X				
Cleveland	0	X	X			0	
Columbus	0	X					
Dayton	0	X					
Middleburg Hgts.		X	X				
Shaker Hgts.	0		X				
Springfield	0						
Toledo	0	X	X			X	X
University Hgts.	0						

KEY: X - Regulations including acoustical criteria
0 - Regulations not including acoustical criteria

The Municipal Noise Ordinance chart was excerpted from Sound and Vibration, December, 1975,

Noise programs are generally administered through the police department. Responsibility for supervision of the noise enforcement activities is frequently delegated to one police officer.

Information on other environmental/industrial noise programs within the state is scarce. It is expected that many of the major industries within the state employ a safety officer who is indirectly involved with industrial noise activities. However, it should be emphasized that the primary focus of the safety officer's activities is upon maintaining a safe and healthful environment within the plant. An auxiliary activity may include monitoring of external industrial noise levels. However, at present, this activity is performed on a voluntary basis. There is no available information on the number of persons in industry who are involved with environmental/industrial noise programs.

C. Workforce Projections

While public awareness and interest in noise programs is beginning to emerge within the state, experts within the field are not optimistic concerning the future of noise pollution and abatement in Ohio. These experts have acknowledged that while little is being done in the area, fiscal constraints will continue to curtail any expansion or development in environmental/industrial noise control. The Ohio Department of Public Health indicated that their level of effort in environmental noise control will remain relatively stable during the next five years.

The Department of Transportation does expect some growth during the next five years; growth will occur in the technician category. The Department anticipates an expansion of its noise monitoring activities; such activities can be adequately performed by technicians. By 1982, there may be an additional 10 to 12 technicians added to the staff.

The Department indicated that while it is not aware of any emerging legislation which would impact the staffing of the Department, it believes that it is entirely possible that such legislation may be introduced during the next five years. If such legislation becomes a reality, it would be quite likely to have an impact on the department.

The Department further speculated that the amount of contractual work will decrease over the next five years, with a consequent decline in the number of consultants retained. The Department did not wish to estimate the percentage of decline. The decline is directly attributable to the changing focus of Department of Transportation programs; more funds are being allocated for maintenance of highways and much less is being applied toward new construction. Much of the work associated with the maintenance program can be accomplished by the existing department staff.

No workforce projections are available for the private sector. Experts in the area have indicated that growth in the noise control area will be minimal, with any expansion in either state or municipal consultation or enforcement activities being directly related to new and, as yet, undefined federal regulations.

D. Training and Certification

Due to the recently emerging interest in environmental noise programs, few programs exist nationally to train either professionals or technical personnel for occupations within the field of environmental noise control. Programs in acoustical engineering or related skills are not currently offered through colleges, universities, community colleges or technical schools within the state. Consequently, individuals with degrees and experience in acoustical engineering are scarce. Concurrently, there is a minimal demand for professionals with experience in this field.

E. Career Potential

The career potential in industrial/environmental noise is presently weak; during the next five years the career potential for the field is not expected to improve significantly. The demand for personnel with experience in noise-related skills is not expected to grow for either the private or public sector; however, there may be an increased demand for technical consultants within the field. The expected growth will be in the demand for persons with qualifications in sound and acoustics and, more specifically, with training and experience in acoustical engineering. The growth will be related to efforts of industry to comply with long-range federal environmental noise regulations.

F. Conclusion

Noise control and abatement programs within Ohio are limited. Only two programs are known which administer limited noise control programs:

the Department of Public Health and the Department of Transportation. These programs were developed in response to federal mandates: the Federal Occupational Health and Safety Act of 1970 and the Federal-Aid Highway Act of 1970, respectively. Neither program anticipates expansion of existing programs or development of new programs during the next five years.

While there is no apparent demand for personnel with experience and training in noise in the immediate future, experts within the field indicate that during the next ten years legislation may be introduced which will stimulate interest and programs in environmental noise control. If such legislation were to be introduced and funds allocated to develop the program, there would certainly be an increased demand for both professional and technical occupations. Any state role in activities under the Federal Noise Control Act of 1972 would have a similar impact. Any predictions on the extent of the demand or on the types of occupations required would be premature at this time.

III. PESTICIDES

A. Introduction

In Ohio the responsibility for regulating pesticide use and control rests with the Ohio Department of Agriculture; specifically the Pesticide Regulation Section located within the Division of Plant Industry. The Pesticide Regulation Section which was created in 1970 has four major functions:

1) certification and licensing of commercial applicators;
2) registration of pesticides, sample analysis, and consumer protection;
3) investigation of pesticide accidents and incidents;
4) certification of private applicators.

The Ohio Department of Agriculture was one of the first states to legislate a commercial applicator licensing program. Ohio initiated a commercial applicator licensing program in 1970. Subsequent to the adoption of the Federal Environmental Pesticide Control Act in 1972, Ohio amended its state legislation to require the certification of both private and limited commercial pesticide applicators. During the past year, the Department of Agriculture has become actively involved in the ongoing certification program for both private and commercial applicators. The Department of Agriculture cooperates with Ohio State University Cooperative Extension Service in the actual training program. During the last half of 1976, the Extension Service began conducting the private applicator training programs.

The state Pesticide Use and Application Act also mandated the organization of a Pesticide Advisory Council. The interagency pesticide council consists of the Director of Agriculture, who also serves as chairperson, the Director of Environmental Protection, the Director of Health, the Director of Natural Resources, the Dean of the College of Agriculture of Ohio State University, the Dean of the College of Biological Science of Ohio State University, the Director of the Ohio Agricultural Research and Development Center, one member of the House of Representatives, and one member of the Senate of opposite political party. The function of the council is to formulate policies and coordinate efforts among state agencies.

In addition to its training activities in the Pesticide Applicator Certification Program the Ohio State University Cooperative Extension Services offers a Pesticide Safety Service. The program serves as a clearinghouse for state and federal pesticide regulations, legislation, registration changes, and information on pesticides and environmental pollution. In addition to its clearinghouse function, which keeps their field staff informed, the service also conducts mini-workshops on safe use of pesticides for various professional and service organizations.

The Ohio Environmental Protection Agency administers a pesticide monitoring program through its Office of Wastewater Pollution Control. The monitoring program is a function of the Emergency Response Program. The office has an organized pesticide runoff monitoring program during the spring and summer months when the use of agricultural pesticides is most concentrated. Surface water samples are monitored on a monthly basis beginning in April and concluding in October. Samples are collected from 17 stations and are analyzed for 15 different parameters. The program, which was organized in October 1973, was originally designed for testing at 26 locations. However, fiscal constraints have required the reduction of the sampling stations to 17.

The Ohio Department of Natural Resources has a limited involvement in the pesticide control field. In addition to serving as a representative on the Pesticide Advisory Council, the department has been authorized to investigate accidents which resulted in the damage of natural resources, and to seek compensation for the damages when negligence is determined. The Division on Wildlife primarily coordinates its activities closely with the Ohio Envionmental Protection Agency Emergency Response Program. The five district offices of the Department of Natural Resources are directly involved with the monitoring and surveillance of the state's streams to ensure that pesticide and oil spills are reported promptly.

The Ohio Agricultural Research and Development Center located at Wooster, Ohio has an extensive program in pesticide research and testing. The Center currently has 300 agricultural and environmental research projects funded. The following is an abbreviated list of projects in the pesticide research and testing field which are currently in progress at the center:

1) Bionomics and Management of Soil Insects;
2) Pesticide Use on Ornamental Plants;
3) Greenhouse Insect Control;
4) Sex Pheromones of the Ash Borer and Black Tut Worm;

5) Pesticide Use on Apples, Small Fruits, and Forages;
6) Pesticides on Soybeans, Sweet Corn, Peppers and Potatoes.

The Research Center is also involved with commodity testing for private industry. This requires testing of specific pesticides on predetermined crops. Research on integrated pest management is additionally being conducted by the Center.

B. Workforce Profile

The Pesticide Regulation Section within the Department of Agriculture employs seven full-time persons to operate the program: four professionals and three clerical positions. The following table depicts the professional staffing levels by occupation.

TABLE IX

OHIO DEPARTMENT OF AGRICULTURE

Pesticide Regulation Section
Current (1976) Staffing Level

Position	1976
Entomologist	2
Agronomist	1
Administrator	1
TOTAL	4

The administrator of the program and the three clerical positions are located in the central office in Reynoldsburg; the two entomologists and one agronomist operate through field offices. The turnover rate for the Department has been negligible during the past five years; the low turnover has been attributed to general staff satisfaction. The only reported turnover during the last year was in a clerical position. There are no vacancies in the section at present. When vacancies do occur, the section recruits applicants through the Civil Service system. However, only individuals with related science degrees are interviewed for available positions.

The Ohio State University Cooperative Extension Service coordinates the pesticide applicator training program. The program has a skeletal staff: a half-time administrator and a quarter-time secretary. The director of the program has background and experience in agro-economics. The Extension Service offers programs in cooperation with the 88 county extension offices. Staff members of the county offices are involved with the programs, but the amount of time allocated to the program by the county specialists has not been determined.

The Extension Service relies upon a pool of experts from the University for instruction at regional workshops. On occasion the state experts conduct training through the county extension services. There is a core team of 17 professionals who are involved in the training: three entomologists, two agricultural engineers, three plant pathologists, four horticulturists, two agronomists, two natural resource specialists, and one veterinarian. In addition to the representatives from the University, commercial or industrial pest control specialists have been contracted to instruct portions of training programs.

Turnover within the Extension Service has been minimal. Over the past two years, as vacancies have occurred the positions have been phased out. The responsibilities of the positions were absorbed by existing staff members.

The Extension Service also offers a Pesticide Safety Program. The program is staffed by one professional. The program coordinator has an M.S. and Ph.D. in agronomy with a background in chemistry. There has been no turnover in the position.

The Ohio Department of Natural Resources has limited staff involvement in pesticide control activities. The Division of Wildlife has assigned responsibility of the program to one staff member who serves as a coordinator of internal programs and as representative on the Pesticide Council. This person allocates approximately 1 percent of his time to pesticide pollution control activities. The five district offices have more in-depth involvement in the program. The district offices are staffed with approximately 100 professionals who allocate 10 percent of their time to monitoring and surveillance of streams for indications of pesticide or oil spills. These professionals have a background in biological science with emphasis in law enforcement, game management, fish management, or public relations. The state coordinator of the program has a background in chemistry, biology, and engineering.

Turnover in all levels of the Division is rare; when position vacancies occur they are frequently filled through internal promotion. The waiting list for available positions ranges from two to four years. The low turnover is generally associated with the type of persons that apply for available positions. They are generally interested in outdoor, sporting activities. The salaries and promotional opportunities are limited.

The Ohio Agricultural Research and Development Center has a total staff of 879 employees: 317 faculty members and administrators; 285 classified supportive staff members (Civil Service); 171 non-classified supportive staff members; 11 post-doctoral candidates; and 96 graduate associates. The professional staff members have backgrounds in agro-economics, agricultural engineering, agronomy, animal science, dairy science, entomology, fishery, wildlife, and outdoor recreation, food science and nutrition, forestry, home economics, horticulture, natural resources, plant pathology, and poultry science.

Turnover for the Center averages approximately 5 to 10 percent annually. The Center has experienced a sharp reduction in staff during the past two years and has cut back approximately 300 staff positions. The cut-back has a result of increasing operational costs without comparable increases in state funding. The Center recruits through advertising in professional journals and interviews with prospective applicants at national and regional professional conferences. It was difficult for the Center to define what percentage of its activities are solely related to pesticide research and development.

The pesticide monitoring program which is offered through the Ohio Environmental Protection Agency is currently staffed with one person. This person has a M.S. in Wildlife Biology. There is minimal turnover within the department; the stability of turnover has been correlated with the small size of the program. When vacancies become available, the department recruits through its personnel office and state universities/colleges offering environmental programs. The department does not advertise vacancies in professional journals or newspapers.

As mentioned in the introduction, Ohio has had legislation requiring the licensing of commercial pesticide applicators since 1970. According to the state legislation there are ten major categories of commercial pest control. The following is a breakdown of the categories with a further definition of designated sub-groups:

1) Aerial Pest Control
2) Agricultural Pest Control
    a) Agronomic Pest Control
    b) Horticultural Pest Control
    c) Agricultural Weed Control
    d) Seed Treatment
    e) Tobacco Sucker Control
    f) Soil Fumigation
3) Aquatic Pest Control
    a) General Aquatic Pest Control
    b) Swimming Pool Pest Control
4) Forest Pest Control
    a) General Forest Pest Control
    b) Timber Stand Improvement
5) Industrial Vegetation Control
    a) General Industrial Vegetation Control
    b) Blacktopping
6) Ornamental Plant and Shade Tree Pest Control
7) Vertebrate Animal Control
8) Turf Pest Control
9) Animal Pest Control
    a) General Animal Pest Control
    b) Sheep Dipping
    c) Animal Quarters Pest Control
10) Domestic, Institutional, Structural, and Health-Related Pest Control
    a) General Pest Control
    b) Termite Control
    c) Fumigation
    d) Mosquito, Housefly and other Vector Control
11) Specialized Pest Control
    a) Public Health Pest Control
    b) Regulatory Pest Control
    c) Demonstration Pest Control
    d) Research Pest Control

Approximately 3,000 persons are currently licensed as commercial pesticide operators/applicators. There is no available breakdown of the number of persons who are licensed for each category. While the number of pesticide applicators in the ornamental plant and shade tree pest control and the turf pest control categories are generally concentrated within the metropolitan areas, all other categories of applicators are distributed evenly throughout the state. There is no information on the number of commercial firms within the state; however, it is estimated that the average crew size is two to three persons. The crew frequently consists of one supervisor and one or more applicator-operator. Turnover within the commercial application field is generally low with an annual average of 0 to 5 percent; the only exception would be in the turf pest control category. Turnover within this category may range from 5 to 10 percent annually. The higher rate of turnover for this category is attributable to applicators opening their own operations.

It is estimated that there are 117,000 farmers in the state. Many may not require certification since the majority of them may limit their application to general use pesticides on their own property. However, it is estimated that up to 20,000 farmers may seek certification as private pesticide applicators.

C. Workforce Projections

The Pesticide Regulation Section proposes a major expansion of its staff during the next five years. In 1976 the Section was staffed by four professionals and three clerical positions; three more professionals have been added in 1977. With the implementation of the federal regulations requiring the certification of commercial and private pesticide applicators, the Section was required to focus its activities upon the pesticide applicator certification program, and consequently curtail its activities in other existing programs and services. To maintain the quality of service and to efficiently coordinate the pesticide applicator certification programs, the Section has requested five additional positions for Fiscal Year 1977-78. These positions would include three field inspectors, one assistant administrator, and one clerical position. Persons recruited for the field inspector positions will have a background in entomology, agronomy or other related fields.

In 1981-82 the Section proposes to add three field inspectors. The three positions will be needed to assist with the ongoing operation of the pesticide applicator certification program. Some assistance in training and certification is currently being provided to the Section by other components of the Division of Plant Industry; however, it is anticipated that this support cannot be continued indefinitely. The following table depicts project staff growth rates to 1982.

TABLE X

OHIO DEPARTMENT OF AGRICULTURE

Pesticide Regulation Section
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Ag. Scientist	1	1	1	1	2	2		10%
Entomologist	2	3	3	3	5	5		23%
Administrator	1	2	2	2	2	2		20%
Other	0	2	2	2	2	2		40%
TOTAL	4	8	8	8	11	11	14%	38%

The Ohio State University Cooperative Extension Service indicated that there was a need for more staff; however, any increase in the department would be totally dependent upon the availability of funding. The director of the program would not speculate on the changes in the workforce during the next five years. However, as new positions are created, the director of the program proposes to recruit individuals with background and training in the pesticide control field. The director added that the most important quality for a prospective employee is the ability to work with people.

The director of the Cooperative Extension Service Pesticide Safety Program does not project any growth in staffing during the next five years. The programs on pesticide safety have been operational since 1965. The operation of the program has been relatively stable since 1965, and there is no apparent emerging demands for additional services.

The Ohio Department of Natural Resources does not anticipate any increase in staffing in its program during the next five years. The Department further indicated that the level of effort for existing positions, i.e., 10 percent, would not increase significantly during the next five years.

The Ohio Environmental Protection Agency Emergency Response Program anticipates an expansion in its pesticide monitoring program activities. One aspect of the program which is currently being implemented is a tissue analysis program for toxic and hazardous substances. The person who is currently on staff will operate the program initially. It is hoped that two to three additional positions will be authorized for the program during the coming five years. The two to three persons would assist with both the tissue analysis program and the monitoring program. The main thrust of the activities would be to strengthen the laboratory capabilities. In addition, another area which has been considered for development is the hazardous waste disposal program. It is expected that the Toxic Substances Control Act and the Resource Conservation and Recovery Act will impact the staffing of the program, although the extent of impact is yet to be determined. As vacancies occur, persons with backgrounds in organic chemistry, biology, ecology and physiology will be recruited.

Experts within the field indicated that growth within the private sector will be extremely limited. Over the next five years, there will be a maximum cumulative growth of 5 percent in the number of commercial and private applicators. This low growth rate is associated with the limited amount of arable land in Ohio.

The Agricultural Research and Development Center expects limited growth over the next five years. A 10 to 15 percent cumulative growth is expected in the staffing requirements; no specific information is available on the types of staff positions which may become available. Program priorities for the immediate future include environmentally related areas, crop production, and social sciences.

D. Training and Certification

The thrust of pesticide training within the state is focused upon pesticide applicator training. Ohio State University Cooperative Extension Service has been delegated the responsibility for coordination of the statewide training program. The program has been operational since 1971. Initially the program was designed to train custom applicators and operators as commercial applicators; their training was offered at numerous locations throughout the state. The programs emphasized recognition of common pests, safe use of pesticides, Ohio pesticide use laws and regulations, and alternative pest control methods. The course was generally offered for five hours.

During 1976, the program was expanded to include training for private applicators. Coordination for regional training workshops and commercial applicator training is most generally provided by the central office at the University. The 88 county extension offices are more extensively involved in the training of private applicators.

From July 1976 to March 1977, a total of 7,062 private applicators have been trained. It is anticipated that 20,000 farmers will be trained as private applicators. The private applicator training programs were held in numerous locations throughout the state to ensure public accessibility of the programs. Training of private applicators is expected to stabilize within the next two to three years.

Between July 1, 1976 and March 1, 1977, a total of 5,447 persons have participated in commercial applicator training programs. There is duplication in the number of persons participating in each session, since some individuals seek certification in more than one category. The following is a list of the number of persons participating in each category between July 1, 1976 and March 1, 1977:

Classification	Number
1) Research and Development	433
2) Ornamental and Turf Pest Control	1,982
3) Seed Treatment	283
4) Industrial, Institutional, Structural, and Health Related	908
5) Plant	1,110
6) Animal Pest Control	94
7) Forest	41
8) Aquatic	167
9) Right-of-Way	257
10) Public Health	76
11) Vertebrate Animal	96
TOTAL	5,447

Each course is offered for five hours. The first two and one-half hours is a general standards review session which includes discussion of federal and state regulations and generalized application skills and knowledge. The second session provides a background and introduction to technology relevant to the particular type of application category. Sixteen programs were held in eleven locations during the period between July 1, 1976 and March 1, 1977. More than one category of training is offered at each program.

There are currently 3,000 persons in the state certified and licensed as commercial applicators. This number is expected to increase in 1977 and remain stable through the next four years.

The Ohio State University Cooperative Extension Service will be a principal means of ensuring continuing education opportunities for the applicators. The State of Ohio is currently in the process of defining specific continuing education requirements for both private and commercial applicators. While no decisions have been made concerning either the content requirements for upgrade training or the number of hours of such training, the Cooperative Extension Service has made contact with various service and professional organizations attempting to organize ongoing educational programs. The response of the organizations has been positive. Much of the continuing education program will be conducted in cooperation with these organizations.

To supplement these training programs, the Cooperative Extension Service will coordinate a comprehensive public information program. Feature articles will be prepared for local newspapers, organizational newsletters, and the Ohio Farmer, a popular statewide magazine. The Extension Service will also use radio and television public service announcements. The County Cooperative Extension Service is actively promoting a pesticide campaign which informs the public about state pesticide use laws and regulations and safe use of pesticides.

E. Career Potential

The career potential for personnel in both the public and private sector appears to be relatively stable through 1982. Some growth is expected in the Pesticide Regulation Section in the Department of Agriculture as a consequence of expanded pesticide applicator certification requirements. Six additional field inspectors and one administrator will be requested during the course of the next five years. These positions will primarily be involved with coordinating the certification training program.

The Ohio Environmental Protection Agency also predicts limited growth in its Emergency Response Program. The growth will be concentrated in the laboratory functions. The program is in the process of developing a tissue analysis program, and future plans call for the consideration of a hazardous waste program. In the event that these programs are developed, an added three professional staff members will be requested.

A maximum of 5 percent cumulative growth is projected for commercial and private pesticide applicators. This low growth rate has been attributed to the limited amount of arable ground in Ohio.

F. Conclusion

Following a review of pesticide pollution control activities in the State of Ohio, these conclusions can be made:

1) that the workforce situation in the private sector is expected to remain reasonably constant through 1982; and,

2) that the public sector is expected to expand on a limited basis, and that this expansion is related directly to programs evolving as a consequence of federal legislation.

During the past two years, the staffing levels of the state agencies involved in pesticide programming have been stable. Emerging changes in the workforce requirements of these agencies are directly correlated to the Federal Environmental Pesticide Control Act, the Toxic Substances Control Act, and the Resource Conservation and Recovery Act. Any changes in workforce requirements beyond those anticipated in this report will be a consequence of yet undefined federal legislation.

IV. POTABLE WATER

A. Introduction

The population and industry of Ohio have placed heavy demands on the state's supply of safe, public water. Presently 75 percent of the Ohio water supply comes from surface sources and 25 percent comes from wells. Lake Erie is by far the best source of surface water in terms of quantity and quality; it currently provides 40 percent of the entire state water supply.

There are 20,000 public water supplies, as defined in the Safe Drinking Water Act (Public Law 93-523), in Ohio. Of this total 2,000 are community systems and 18,000 are non-community systems. Nine hundred of the community systems are under surveillance by the Ohio Environmental Protection Agency's Office of Public Water Supply. This office has the task of providing a safe public water supply from a variety of sources.

Monitoring and surveillance constitute a large portion of office activities. In 1976 continual chemical monitoring was conducted for 18 parameters at 180 municipalities, 562 groundwater sources, 212 institutional facilities, 510 public school systems and 540 mobile home parks. Monitoring and sampling for radiological materials, pesticides, and poly-chlorinated by-phenyls (PCB's) was expanded during the past year. Preparations are also underway for the office to assume state primacy in enforcement of the Safe Drinking Water Act.

The Office of Public Water Supply is responsible for a statewide comprehensive public water supply program for ensuring adequate quantities of safe, palatable water for human consumption and use. Structurally the office is divided into four Divisions: Facilities and Operations, Water Quality, Engineering, and Groundwater. The office also maintains a staff in five Ohio EPA District offices.

The Division of Facilities and Operations has responsibility for a comprehensive program of regular sanitary surveys of all public water supplies. The Division maintains records on each supply and provides technical assistance to supply entities. Investigation of consumer complaints, efficient operation of facilities, and training and certification of water supply operators are among the other duties of this Division.

The Division of Water Quality is concerned with health-related standards and supervises the chemical, radiological, pesticidal and toxicological aspects of water supplies. Additionally the Division maintains a laboratory certification program for potable water analysis and takes legal action to enforce quality standards.

The Division of Engineering provides technical engineering services to other divisions and offices; it is also responsible for surveillance of planning, development and construction of new or existing water supply systems. The final division in the Office of Public Water Supply is the Division of Groundwater. This Division attempts to prevent groundwater contamination through land use practices and adequate well construction. The Division engages in sampling and monitoring of groundwater supplies and does hydrogeological evaluations of proposed land disposal sites.

Another agency with responsibility in the potable water area is the Ohio Department of Natural Resources (ODNR) Division of Water. The activities of the Division are perhaps best capsulized by noting the four sections within it: Dam Permits and Inspection, Water Resource Development, Water Inventory, and Resource Analysis. Of particular interest are Division activities relating to water management programs, water systems, groundwater, and well information.

B. Workforce Profile

The Ohio EPA Office of Public Water Supply is presently composed of a staff of 30 persons, 13 in Columbus and the remainder in district offices. The staffing level by Division within the office is shown in the following table.

TABLE XI

OHIO ENVIRONMENTAL PROTECTION AGENCY

Office of Public Water Supply
Current (1976) Staffing by Division

Division	1976
Administrative	4
Facilities and Operations	2
Water Quality Standards	2
Engineering	3
Groundwater	2
TOTAL	13

The total 30-member staff is shown in the following table with breakdown according to occupational classification.

TABLE XII

OHIO ENVIRONMENTAL PROTECTION AGENCY

Office of Public Water Supply
Current (1976) Staffing Level

Position	1976
Engineer	20
Chemist	1
Geologist	4
Operator	1
Administrator	1
Clerical	2
Other	1
TOTAL	30

The number of engineers in the office reflects the responsibilities of the office in public water safety and construction programs. Approximately 80 percent of the engineers are civil and sanitary engineers, with the others being mechanical engineers or engineering physicists.

As noted, the Division of Water of ODNR is the other statewide agency active in the potable water field. While the Division has a staff of 70 persons, the sections on Water Inventory and Water Resources Development are most concerned with safe water supplies. The Water Inventory Section has a staff of nine and the Water Resources Development Section has a staff of 20. The following table presents a breakdown of these positions by job category.

TABLE XIII

OHIO DEPARTMENT OF NATURAL RESOURCES

Division of Water
Section on Water Inventory and Water Resource Development
Current (1976) Staffing Level

Position	1976
Geologist	6
Biologist	2
Environmental Scientist	1
Researcher/Planner	5
Engineer	3
Administrator	3
Clerical	3
Intern	1
Other	5
TOTAL	29

The "Other" category includes a geology technician, two technical writers, an artist, and a photo analyst. The geologists are generally specialists in hydro-geology.

The largest workforce segment in the potable water field in Ohio is made up of treatment facility and distribution system personnel. Currently there are approximately 2,500 certified water supply personnel total in the various classes.

TABLE XIV

STATE OF OHIO

Certified Water Treatment Plant and Distribution System Operators
Current (1976) Staffing Level

Classification	1976
Class I	1,282
Class II	467
Class III	384
Class IV	38
TOTAL	2,171

TABLE XIV (Cont.)

Classification		1976
Class I		357
Class II		104
	TOTAL	461

Class I is the lowest classification and Class IV (or II) is the highest. The above fiqures are based on totals since the certification process was initiated in 1938. Figures for some classes may not be accurate, and it is impossible to determine how many of those people certified are currently employed in respective capacities. It is estimated that 90 percent of the certified operators are still employed at those jobs. Even with this number of operators, it is estimated that 40 percent of the Ohio treatment plants do not have properly certified personnel. Many of the plants without certified personnel are small operations with minimal distribution or treatment activities. The following represent basic qualifications for the four classes of operators:

Class I: High school graduation or its equivalent. Interest in sciences and mathematics. Ability to do simple arithmetic. Mechanical aptitude.

Class II: High school graduate or its equivalent. Knowledgeable in sciences and mathematics. Mechanical ability. Experience in mechanical and electrical equipment operation and maintenance. Knowledge of water chemistry.

Class III:	High school graduate or its equivalent. Knowledge and training in basic sciences. Extensive experience in plant operation and maintenance. Courses in water chemistry, electricity, bacteriology, laboratory techniques.
Class IV:	College degree in science or engineering. Broad experience in operation and maintenance of water supply works. Special courses in chemistry, sanitary engineering, and management. Competency to work successfully within the governmental framework. Management ability.

A notable example of a large-scale workforce is the Cleveland area water treatment operation. It is estimated that 1,300 people are employed in all phases of water treatment by the Cleveland Division of Water and Heat including administrators, operators, meter readers, clerical and others. A unique segment of the Division is the Water Quality Control Laboratories. The Laboratories are active in water analysis, detection of source contaminations, and meeting federal and state water testing requirements. The present staff of 24 includes chemists, biologists, geologists, engineers, technicians, and administrators.

C. Workforce Projections

Many effects of the Safe Drinking Water Act of 1974 are beginning to make themselves felt at Ohio EPA Office of Public Water. As can be seen from Table XII above, engineers comprise the bulk of the workforce in this area; from all projections, the concentration of engineers is expected to continue. Projected growth is shown in the following table.

TABLE XV

OHIO ENVIRONMENTAL PROTECTION AGENCY

Office of Public Water Supply
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	20	36	40	44	57	66	n/a	27%
Chemist	1	3	3	4	4	5	n/a	52%
Geologist	4	5	5	5	6	6	n/a	9%
Operator	1	1	1	1	2	2	n/a	20%
Administrator	1	2	2	2	3	3	n/a	30%
Clerical	2	2	3	3	3	3	n/a	10%
Other	1	1	1	1	1	1	n/a	0
TOTAL	30	50	55	60	76	86		25%

Nearly all growth in staff is expected because of the Safe Drinking Water Act requirements, particularly in control over semi-public water supplies. It is expected that most additional engineers will be in District Offices of Ohio EPA. Turnover and attrition have reduced the office workforce by eight positions since early 1975. It is difficult to determine a turnover rate because budget restrictions have not allowed the replacement of many people who do leave.

Growth rates for ODNR Division of Water are more difficult to project because there is no single factor, such as the Safe Drinking Water Act, to which workforce needs can be tied. Some growth may occur in technical advice and planning roles; flood plain management and Lake Erie erosion problems are likely to lead to workforce growth possibilities. A number of uncertainties in legislative and regulatory matters were also noted as affecting future staff levels. Non-point pollution abatement responsibilities are currently being determined and a state land use law is under consideration.

The number of certified operators in the state can also be expected to increase based on the number of plants without properly certified personnel. Certification in minimal treatment techniques is a strong possibility for a number of small facilities. Estimates from the Cleveland Division of Water and Heat indicate possible 10 to 20 percent growth over the next five years. Most of this growth is expected to be in enforcement fields such as lawyers and technicians. Other local operations may experience similar growth within budget guidelines.

D. Training and Certification

Operator training and certification for water supply and water distribution personnel is generally handled by the Operator Training Committee of Ohio, Inc. (OTC). Assistance and input is of course provided by the Office of Public Water Supply and other state agencies. Further information on OTC and its programs is contained in Part D of the Wastewater section of this report.

Facility classifications are made according to water source, quality, treatment method, distribution and population or usage. Some form of training is available in each of these areas. It is possible that some form of minimal training, probably relating to chlorination, will be required of small or semi-public water supply personnel. In addition there is a trend to focus more on treatment and chemistry involved--with emphasis on population served--in training and classifying operators and facilities.

The Office of Public Water Supply has been instituting a great deal of on-the-job training (OJT) recently in an effort to carry out staff responsibilities under the Safe Drinking Water Act. Indications are that this training will continue as new personnel are added specifically to deal with Act requirements.

Other public agencies contacted indicated that a certain amount of OJT is a necessity for specific job roles. In addition, the ODNR Division of Water is actively involved in a student intern program which has led to a number of hirings and has reduced reliance on OJT. The Division personnel have also taken advantage of a number of middle-level management seminars when available.

The use of EPA-sponsored upgrade training programs has been reduced because of budget limitations. Very little information is currently available regarding formal training availability in the public water supply area.

E. Career Potential

Growth projections indicate fairly good career prospects in the public water supply field. This is particularly true for civil and sanitary engineers who may be needed as a result of the Safe Drinking Water Act. Competition with and openings in the private sector improve career opportunities for trained engineers.

Openings for technicians are likely to be good in complex local water supply operations and in water quality management planning and control. Some opportunities will exist for water supply operators both to fulfill existing needs and for control of new supplies pursuant to the Safe Drinking Water Act.

F. Conclusion

The Safe Drinking Water Act of 1974 is the most significant factor in water supply planning over the next five years; workforce growth and program priorities will be tied very closely to the Act. Engineers and technicians will be the occupations most in demand to fill positions. Although very little information is available on formal water supply educational programs, there appears to be little difficulty in filling positions. Limited upgrade training may be an area of future concern.

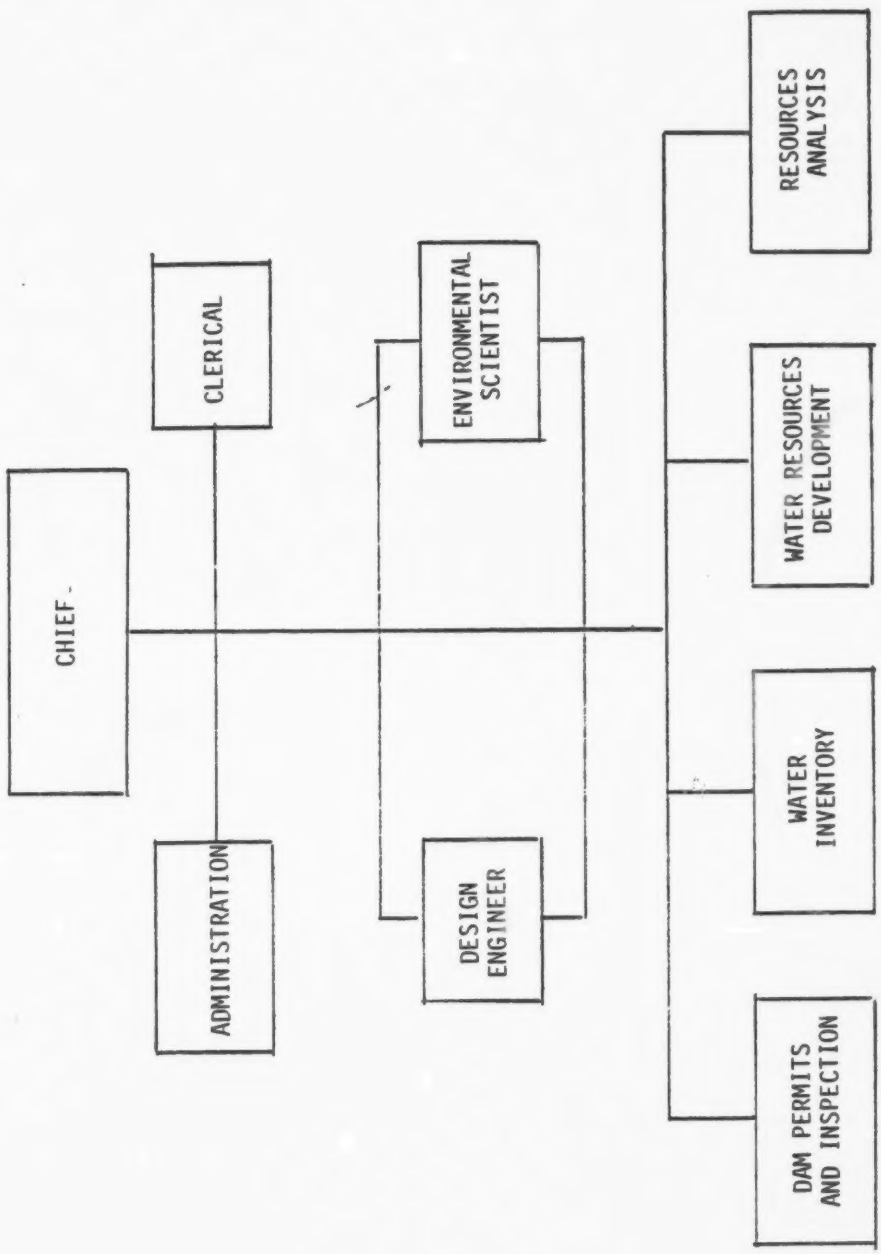
Ohio's early entry into the water supply operator certification field has resulted in a well-developed program. If growth at the local level follows the trends anticipated for Cleveland, reliance on the training and certification program will be greater in the future.

Ohio's early entry into the water supply operator certification field has resulted in a well-developed program. If growth at the local level follows the trends anticipated for Cleveland, reliance on the training and certification program will be greater in the future.

Figure 4

OHIO DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER


CHIEF
CLERICAL
ADMINISTRATION
ENVIRONMENTAL SCIENTIST
DESIGN ENGINEER
RESOURCES ANALYSIS
WATER RESOURCES DEVELOPMENT
WATER INVENTORY
DAM PERMITS AND INSPECTION

V. RADIATION

A. Introduction

Environmentally related activities in the radiation field are currently rather limited in Ohio. There were no nuclear power plants operating in the state during 1976; in addition, many of the duties in the field are currently being handled federally by the Nuclear Regulatory Commission (NRC).

The Radiological Health Unit within the Ohio Department of Health is responsible for radiation control and enforcement in the state. The Unit is a subsection of the Division of Technical Environmental Health Services. The Unit has two basic responsibilities: 1) enforcement of radiation standards not covered bv the Nuclear Regulatory Commission in medicine, industry and energy; and, 2) control of isotopes and radiators not covered by the Nuclear Regulatory Commission.

Currently, Ohio is not involved with licensing of radiation sources within the state; however, legislation is being prepared which will enable the Radiological Health Unit to license both medical and non-medical sources. While the state does not have a licensing program, it does have an ongoing registration program. There are two classifications of registrations within the program: medical and non-medical. As of March 1977, there were 5,576 facilities registered in the medical category, and 359 registered in the non-medical category. According to the legal definition, non-medical sources are those programs which do not apply radiation to humans for either diagnostic or therapeutic purposes. The one exception is veterinary medicine; it is included in the medical category.

Ohio has a regulatory program for registration of radiological health X-ray programs. There are an estimated 4,830 dental X-ray programs, 5,114 medical X-ray programs, and 292 non-healing art X-ray programs. In addition, there are 775 programs in the state with NRC licenses. (Statistics taken from a report prepared for the U.S. Department of Health, Education, and Welfare, Report on State and Local Radiological Health Programs, October, 1976.)

Ohio is not an NRC agreement state; however, the state legislature has passed legislation which authorizes the state to negotiate agreement state status with NRC. The state is currently in the process of designing and implementing programs and policies which will facilitate compliance with agreement state eligibility requirements. How soon Ohio will become an agreement state is as yet undetermined.

B. Workforce Profile

The Radiological Health Unit is currently staffed with five full-time professionals and one clerical position. In addition, clerical support is provided to the Unit by other sections of the division. This support approximates one full-time clerical position. There has been no growth in the Unit over the past year. The following table illustrates the distribution of staff by occupational type.

TABLE XVI

OHIO DEPARTMENT OF HEALTH

Radiological Health Unit
Current (1976) Staffing Level

Position	1976
Engineer	1
Health Physicists	4
TOTAL	5

The engineer is also the director of the Unit. Turnover in the Unit is minimal, averaging no more than 1 percent annually. Since the initiation of the program, only one staff member has left. The low turnover is attributed to the small staff.

One major problem which has been identified with regard to workforce requirements is the apparent scarcity of qualified health physicists and technicians with background and experience in radiation surveillance and control. This problem complicates the recruitment activities. Most health physicists and radiological health technicians command high salaries within the private sector; generally, these salaries cannot be offered by the Department of Health. Consequently, the section recruits persons with limited training in radiation control and provides them with supportive training in radiological health techniques. The Unit does not have an active recruitment program; as vacancies occur, the Unit will review what applications are currently on file and schedule personal interviews as appropriate.

Workforce statistics for the "radiation control" occupations within the private sector are nebulous. Currently there is limited state involvement in the field. There are an estimated 350-400 safety officers involved with certain aspects of radiation control within private industry. Turnover within this segment is relatively low. There are approximately 250-300 physicists, physicians, and radiological technicians employed at medical centers who have some radiation control responsibilities. Turnover for these positions is slightly higher, averaging up to 15 percent annually. There is no information available on the radiation control workforce levels within research centers.

Three nuclear power plants are planned in Ohio. One of the three units of the Davis-Besse Nuclear Power Station is scheduled for operation in 1977. The Davis-Besse Plant is a division of Toledo-Edison--Cleveland Electric Illuminating Company. The first unit will have an operating capacity of 906,000 kilowatts; the second unit which is scheduled for completion in 1983 and the third, which is scheduled for operation in 1985, will have the same operating capacity. The plant is located at Oak Harbor, Ohio.

The second nuclear power plant is planned for Perry, Ohio. The plant (Perry Nuclear Power Plant) is operated by Cleveland Electric Illuminating Company. There are two generating units which will produce 1,205,000 kilowatts each. The first unit is scheduled for operation in 1980 and the second in 1982.

The third nuclear power complex, the William H. Zimmer Nuclear Power Station, will be located at Moscow, Ohio. The first unit of the plant which is scheduled for completion in 1979 will produce 810,000 kilowatts; the second unit which is planned for operation in 1986 will produce 1,170,000 kilowatts. The Zimmer Plant will be operated by Cincinnati Gas and Electric Company.

Workforce profiles and projections for the radiation control staff of these plants are not currently available. However, it was acknowledged that staffing configurations would include engineers, instrument technicians, health physicists, health physics technicians, quality control specialists, electrical and mechanical maintenance workers, biologists, chemists and clerk/typists.

C. Workforce Projections

The Radiological Health Unit is projecting staff growth within the next five years. The exact growth projections will be determined by whether the state legislature adopts legislation which will allow the state to license radiation sources. If legislation is adopted, the Unit will request two additional positions in 1980. The two positions, health physicists, will be needed to continue the quality of program services. No major expansion of services is currently planned.

However, if the legislation is approved, the Unit would require a substantial increase in staffing. A total of ten to fifteen additional health physicists would be needed. It is anticipated that the legislation would have a major impact on the Unit as early as 1979. The department would consider requesting five positions for 1979, five in 1980, and up to five in 1981.

Increases within the private sector are expected to be minimal. No growth is expected in the number of safety officers involved within industry. One reason given for this stability is that industries find the NRC application and monitoring systems too complex. There may be some growth in staffing at medical centers; however, the amount of growth cannot be determined. The increase would be related to a greater emphasis upon radiation-related safety at medical centers.

D. Training and Certification

The Radiological Health Unit provides new job entrants with an informal training program. The training generally consists of on-the-job sharing with more experienced employees. The Unit does participate in in-service training. Two of the staff members have attended the ten-week short course in health physics offered by the Oak Ridge Associated University sponsored by the U.S. Nuclear Regulatory Commission. While the exact amount of person-time allocated to continuing education varies each year, the Unit takes advantage of the limited upgrade and in-service training as available.

E. Career Potential

The career potential for health physicists is considered by experts to be extremely bright. The demand for persons with experience in health physics will be increasing as the nuclear facilities become operational. This demand will be amplified if the state legislature adopts regulations which would allow the Department of Health to license radiation sources. There will be some growth in the private sector, but for the most part it will be limited to medical centers. Any additional growth, beyond this projection, would necessarily develop as a result of new, undefined federal requirements.

F. Conclusion

Two basic conclusions can be drawn from the information available on the current and projected radiation-related workforce requirements:

1) that the Radiological Health Unit will expand its programs and staffing as greater demands are placed upon the program for licensing of sources and monitoring of radiation levels around nuclear power facilities; and,

2) that the career potential for health physicists in radiation control programs is extremely bright; however, persons trained in radiation control are rare.

Training programs which educate health physicists have limited availability. Educational institutions within the state have not fully explored the possibility of offering health physics programs.

VI. SOLID WASTE

A. Introduction

Closely related to Ohio's prominent status as a large manufacturing state are the production and disposal problems of a large amount of industrial waste. These wastes often contain resins, chemicals, pesticides, and other hazardous substances presenting special handling problems. Each year, more than seven million tons of municipal solid waste are discarded in Ohio. A recent survey by the Ohio EPA Office of Land Pollution Control indicates that Ohio is one of the largest producers of industrial wastes in the country. The gross amounts of waste per year, as reported by industries responding to the survey, indicated that at least 39 million pounds of volatile wastes are incinerated, 151 million pounds of industrial wastes are spread on the land, 16 million cubic yards of industrial wastes are disposed of in landfills, and 2.5 billion gallons of liquids and industrial semi-solids are disposed of in lagoons. The disposal of hazardous wastes is fast becoming one of the State's more important problems. There are indications that Ohio industry may lead the nation in the amount of potentially toxic and hazardous wastes being generated and disposed of without adequate control.

The state lead agency in the solid waste area is the Ohio Environmental Protection Agency. The Office of Land Pollution and Control of Ohio EPA is charged with directing the control and disposal of solid waste in the state. The office is composed of the Division of Solid Waste Management Operation, the Division of Planning and Technical Assistance, and a Hazardous Waste Control Coordinator.

The Division of Solid Waste Management Operations investigates proposed disposal sites, reviews and evaluates disposal plans, and assists geologists in establishing landfill monitoring programs. The Division prepares necessary guidelines for site investigations, plan review, process evaluation and equipment requirements, and assists in preparation of necessary legislation and regulations; it conducts local solid waste program surveys, and assists and advises local health departments in program maintenance.

The Hazardous Waste Control Coordinator prepares plans, collects data and prepares guidelines for controlling disposal of hazardous wastes. The Coordinator reviews and approves plans for collection, transportation, temporary storage, site selection and recovery/disposal of hazardous wastes. This Coordinator also assists other Ohio EPA offices in reviewing plans for disposal of hazardous wastes, assists district offices and the attorney general's office in enforcement and litigation activities and prepares guidelines for land application and disposal of municipal and industrial sludge.

The Division of Planning and Technical Assistance is responsible for identification of planning strategies and procedures at state and local levels and definition of organization and institutional roles in plan implementation. It assists communities and planning agencies in solid waste planning and coordinates Ohio EPA with local and regional solid waste planning programs. It compiles data and information for grant requests and monitoring of state and federally funded solid waste planning programs.

B. Workforce Profile

The Office of Land Pollution Control is currently staffed with twelve professionals, one CETA temporary employee, and one clerical person. Of the professionals, four are situated in the five EPA District Offices. The CETA worker supplements the staffing in one District Office. The professionals consist of one solid waste specialist and four sanitarians. The CETA worker is performing sanitarian functions.

The Central Office located in Columbus is staffed with three engineers, three solid waste scientists, two sanitarians, and one clerical worker. In addition to the permanent staff, the office has one temporary 208 planner; the planner will be with the office for a maximum of six months.

In May, 1975, the office, including the central and district offices, was staffed with 24 positions; an additional 14 positions had been authorized. Since May, 1975, there has been a steady decline in the funds available to support the staffing level.

The following table illustrates the distribution of full-time, permanent professionals in both the central and field offices by occupational category.

TABLE XVII

OHIO ENVIRONMENTAL PROTECTION AGENCY

Office of Land Pollution and Control
Current (1976) Staffing Level

Position	1976
Engineer	3
Scientist	3
Sanitarian	6
TOTAL	12

Turnover within the central office is relatively low. The average term for employees is approximately 3-4 years. The field offices have experienced significant turnover in the engineering positions with an average of 40-50% annually. This high turnover rate is attributed to lack of career mobility and better job options within the private sector. During the last year, there has been one major factor contributing to turnover: the Ohio Environmental Protection Agency has recently completed a job reclassification program. Many of the positions were reclassified at a lower level.

When position vacancies occur, the Office initially solicits applications from qualified individuals within the Agency. Other methods which are utilized are personal contacts, and advertising under its Equal Opportunity Employer Program.

Limited information is currently available on the private sector workforce in the solid waste area. However, preliminary efforts are being made to collect such information. As information becomes available, it will be attached as an addendum to this section.

C. Workforce Projections

The Office of Land Pollution and Control will possibly experience a major growth during the coming five years. It is anticipated that by 1982, the division will be staffed with 31 professionals and two clerical positions. The following table represents possible workforce projections for the division through 1981.

TABLE XVIII

OHIO ENVIRONMENTAL PROTECTION AGENCY

Office of Land Pollution and Control
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	3	5	7	9	9	9	45%	27%
Scientist	3	3	7	7	7	7	10%	27%
Sanitarians	6	7	10	14	15	15	5%	21%
TOTAL	12	15	24	30	31	31		23%

The above table represents the cumulative growth for the central offices and the five field offices. A significant proportion of the growth predicted for the solid waste program will occur in the five field offices; of the 19 proposed positions, thirteen will be located within the district offices. The thirteen positions includes four engineers and nine sanitarians. The growth within the central office will consist of the addition of one engineer and four solid waste scientists.

The single most important factor affecting workforce projections in the solid waste area is the Resource Conservation and Recovery Act of 1976. This far-reaching Act mandates a strong federal role in the management of solid wastes, particularly hazardous wastes, as well as imposing responsibilities on and presenting new opportunities for the states. Moderate growth was anticipated prior to passage of the new Act, most of it in the District Offices. In light of the Resource Conservation and Recovery Act, substantial growth is now predicted. As outlined in the Act, hazardous waste control and supervision will be much more comprehensive in the future.

D. Training and Certification

While no formal, comprehensive private sector solid waste training program currently exists within Ohio, the Ohio Environmental Protection Agency is currently preparing legislation which would facilitate the development of such training. The legislation, which is being developed as a consequence of the Resource Conservation and Recovery Act, would mandate the supervision of a solid waste management facility by a full-time, certified operator. The legislation as proposed would require that a certified operator be available at the site during operational hours. Additionally, the legislation would conceivably necessitate the development of training and certification programs for operators at Hazardous Waste Management Facilities and at Resource Recovery Programs.

A limited amount of private sector training is currently being offered through the field offices. The field offices have offered sanitary landfill operator training on a request basis for individual programs. The programs are generally organized on an informal basis, with the content of the program focusing upon the specific needs of the facility. Approximately 45 persons participated in such training during the last fiscal year (1976-77).

The Office of Land Pollution and Control encourages its staff members to participate in continuing education programming. No information is currently available on the number of persons annually participating in such programs. The principal focus of the training programs has been in the administrative skill development area. All new employees are provided with basic on-the-job training. Most training is provided through information sharing with more experienced employees.

E. Career Potential

New specialized treatment of hazardous wastes and increasing amounts of nuclear reactor waste should provide for many career opportunities in the solid waste field. Solid Waste Scientists and Environmental Technicians will be needed in increasing numbers as the Resource Conservation and Recovery Act is implemented nationwide.

Other changes in the solid waste field are likely to result in more planning and a larger workforce. With landfill sites rapidly disappearing, a permit system for disposal is likely to be developed to lead to more efficient use of remaining areas. Additionally, more innovative methods of resource use and recovery will need to be developed and implemented; provision for research in this area is contained in the new federal legislation.

F. Conclusion

During the next five years, the Office of Land Pollution and Control will experience significant growth in the staffing of both its central and district offices. This growth will be a function of the compliance requirements of the Resource Conservation and Recovery Act (RCRA). The Office will require additional staff positions in the engineering, scientist, and sanitarian categories. The overall annual growth will be approximately 23%.

With the implementation of the program activities necessitated through RCRA, the state will also be actively involved with the design and implementation of training programs for private sector employees in Solid Waste Management Facilities, Hazardous Waste Management Facilities, and Resource

Recovery Operations. No plans have been formalized which address this emerging program demand.

Finally, it is anticipated that all areas, including training, in solid waste relation programs will experience considerable growth during the next five to ten years.

VII. WASTEWATER

A. Introduction

Ohio's industry and population have led to a great deal of state activity in the wastewater and water pollution control fields; this activity has been particularly in evidence since passage of the 1972 Amendments to the Federal Water Pollution Control Act. Among Ohio's unique water pollution problems are the Cuyahoga River-Lake Erie area, unreclaimed strip mine lands, and a variety of uses along the Ohio River. Additionally, Ohio was one of the early leaders in certification in water and wastewater works certification.

There are currently 988 wastewater facilities in Ohio operating under permits issued by Ohio EPA; 857 of these are in Classes I and II or semi-public categories and 131 are in Classes III and IV. There are in excess of 1,000 facilities in the 25,000 gallon per day category which are not required to have permits. Additionally there are approximately 1,300 industrial treatment facilities in the state.

Key activities of Ohio EPA in 1976 included: initial work on water quality management plans pursuant to Sections 208 and 303 of Public Law 92-500; continued work on controlling pollution along the Lower Mahoning River; and establishment of 91 primary water quality monitoring sites. The Ohio Department of Natural Resources has also had a major role in water development planning under Section 208.

Responsibility for wastewater treatment facilities, point sources and other water pollution problems rests primarily with Ohio EPA Office of Wastewater Pollution Control. The Office administers Public Law

92-500 as it applies to Ohio and the state water pollution control law. Basic functions include:

1) Development of plans to control and abate water pollution;
2) Administration of federal grant programs;
3) Adoption and enforcement of water quality standards;
4) Administration of the state NPDES program.

Structurally the Office is composed of six divisions: Industrial Wastewater, Public Wastewater, Surveillance and Laboratory Services, Engineering, Water Quality Standards, and Technical Records. The Divisions of Industrial Wastewater and Public Wastewater share responsibility for NPDES program. Other divisions are involved in water sampling, 1983 pollution goals, and data processing.

The Cleveland Regional Sewer District (CRSD) is comprised of the City of Cleveland and 38 suburban municipalities; it has been viewed as a model in intergovernmental cooperation in helping to solve the serious water pollution problems in the Cleveland area. CRSD serves a population of approximately 1,300,000 persons through its three major facilities. The Westerly Plant has a capacity of 50 million gallons per day (MGD); the Easterly Plant has a 120 MGD capacity with expansion planned; the Southerly Plant has a 115 MGD capacity with facility expansion planned to 200 MGD.

The Ohio River Valley Sanitation Commission (ORSANCO) is active in controlling pollution along the length of the Ohio River, but most of its workforce is located in Ohio. The ORSANCO Compact of 1948 formed the Commission through the efforts of eight states--Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia, and West Virginia. ORSANCO originally had a major regulatory role but much of this has been taken over by state NPDES programs; as a result evaluation and stream monitoring functions have become more dominant. ORSANCO can have a key standard-setting and planning role, particularly in an area like the Ohio Basin where intergovernmental cooperation is crucial.

B. Workforce Profile

Workforce information was obtained from the Ohio EPA Office of Wastewater Pollution Control which is the state lead agency in water pollution matters, the Cleveland Regional Sewer District, and the Ohio River Valley Sanitation Commission (ORSANCO). Cleveland is used to show a local workforce analysis and should be considered particularly in conjunction with the wastewater operator figures. ORSANCO is an interstate agency with headquarters in Cincinnati and for purposes of the study will be dealt with in this report; most of its workforce is located in Ohio.

There is a staff of 55 people in the Columbus Office of Wastewater Pollution Control, with an additional 69 persons connected with the office are stationed in Ohio EPA district offices. By Division, the personnel are distributed according to the following table.

TABLE XIX

OHIO ENVIRONMENTAL PROTECTION AGENCY

Office of Wastewater Pollution Control
Current (1976) Staffing by Division

Division	1976
Industrial Wastewater	9
Public Wastewater	13
Water Quality Standards	4
Data Processing	19
Engineering & Admin. Services	3
Surveillance & Admin. Services	7
District Offices	69
TOTAL	124

There are currently 31 authorized vacancies in the various divisions; general budget restrictions have hampered the filling of these positions. The following table provides a breakdown by occupational category of the Columbus office personnel.

TABLE XX

OHIO ENVIRONMENTAL PROTECTION AGENCY

Office of Wastewater Pollution Control
Current (1976) Staffing Level

Position	1976
Engineer	12
Chemist	3
Biologist	5
Water Quality Scientist	3
Grant Coordinator	4
Data Processor	7
Administrator	8
Clerical	7
Other	6
TOTAL	55

The "Other" category noted above includes technical typists and machine operators for water monitoring equipment. The number of data processors is indicative of the monitoring, record keeping, and report compilation which is carried on by this office. The engineers are normally civil engineers or have special environmental training.

While it is not a typical wastewater treatment facility, the Cleveland Regional Sewer District (CRSD) does provide a comprehensive picture of a treatment operation with a large workforce in a wide variety of positions. The CRSD is a quasi-public organization designed to provide sewer services on a regional basis; it is one of the largest operations of its kind in the country.

Of the 359 employees, 275 are involved in some phase of operation at one of the three treatment plants run by CRSD. The remaining 84 positions are in Administration, Laboratory, and Control Systems. The following table provides a composite occupational category breakdown for the Easterly, Southerly, and Westerly CRSD plants.

TABLE XXI

CLEVELAND REGIONAL SEWER DISTRICT

Current (1976) Staffing Level of Three Treatment Facilities

Position	1976
Superintendent	3
Assistant Superintendent	8
Shift Manager	13
Maintenance Manager	4
Labor Supervisor	8
Plant Operator	
A	6
B	19
C	57
D	38

TABLE XXI (Cont.)

Position	1976
Maintenance Machinest	9
Maintenance Mechanic	19
Maintenance Electrician	5
Instrument Technician	3
Equipment Operator	6
Storekeeper	3
Storekeeper Clerk	0
Plant Attendant	38
Operations Clerk	2
Maintenance Helper	17
Security Guard	12
Clerk	5
TOTAL	275

The Southerly Treatment Plant is the largest of the three facilities and employs approximately 50 percent of the above total; planned expansion of Southerly will make it the largest plant of its kind in the nation, with more personnel. Grade A is the highest classification and Grade D is the lowest. The 54 maintenance personnel noted in the above table reflect the scope of the operation.

The staff in Administration, Laboratory, and Control Systems are located at offices away from the treatment plants. Occupational categories present in this division include administrators, engineers, attorneys, personnel managers, trainers, and accountants. The overall structure of CRSD is depicted in the organizational chart following this section.

At the end of 1968 there were 495 wastewater treatment facilities in Ohio, and approximately 99 percent of these had a certified operator in responsible charge. As noted earlier there are 988 classified facilities operating under a permit in Ohio and nearly all of these are in the charge of a certified operator. This high degree of compliance with certification needs can be attributed to the state's early entry into the operator certification field. Wastewater treatment works are classified from Class I to Class IV based on a point system giving consideration to treatment method, size of facility, and population served.

There are approximately 4,140 certified water and wastewater operators in Ohio. Estimates are that 1,640 of these people are wastewater operators. The number currently active in water supply and wastewater activities according to Class is not currently available; an update of these figures based on classification is presently underway within the Office of Wastewater Pollution Control.

Class IV is the highest classification and Class I is the lowest. In addition to requiring a classification in a grade corresponding to that of the facility, the following qualifications must also be attained:

Class I: High school graduation or its equivalent. Interest and aptitude in sciences and mathematics. Ability to do simple arithmetic. Mechanical aptitude.

Class II: High school graduation or equivalent. Knowledgeable in sciences and mathematics. Good mechanical aptitude. Experience in mechanical and electrical equipment operation and maintenance. Knowledge of wastewater chemistry, hydraulics and bacteriology.

Class III: High school graduation or its equivalent. Knowledge and training in basic sciences. Broad experience in plant operation and maintenance. Special courses in wastewater chemistry, electricity, bacteriology, laboratory techniques.

Class IV: College degree in science or engineering. Broad experience in operation and maintenance of wastewater works. Courses in chemistry, sanitary engineering and management. Competency to work successfully within the governmental framework. Management ability.

ORSANCO is currently composed of a staff of 28 persons and has a governing board of 27 members, three from each of the eight states and three from the U.S. EPA. The bulk of the ORSANCO staff is located in Cincinnati, and significant laboratory support is provided by the Ohio Department of Health and the Pennsylvania Department of Environmental Resources. Three surveillance specialists are located in Indiana, Kentucky, and Pennsylvania, and two laboratory people have offices in Pittsburgh. The staff has grown from 14 people in early 1968 to its present level. Staff breakdown according to occupational category is shown in the following table.

TABLE XXII

OHIO RIVER VALLEY SANITATION COMMISSION

Current (1976) Staffing Level

Position	1976
Engineer	6
Life Scientist	5
Chemist	2
Data Processor	5
Investigator	2
Clerical	8
TOTAL	28

The engineering category is composed largely of sanitary engineers and chemical engineers; water resource and environmental engineers are also present. Biologists are the most common life scientists and they compose the three surveillance specialists. No equivalency figures are available for the lab support work provided by Ohio and Pennsylvania agencies.

C. Workforce Projections

The workforce projections presented herein represent the best professional judgements of various agency personnel. The 1972 Amendments to the Federal Water Pollution Control Act greatly expanded the planning and permit issuance activities of the Ohio EPA Office of Wastewater Pollution Control. Most of the growth necessitated by this legislation has already taken place, and only modest growth is anticipated over the next five years.

Personnel at the Office of Wastewater Pollution Control were hesitant to make workforce projections, noting the many changes that have occurred in the office in recent years. Recent reorganizations and fluctuating staff levels because of budget restrictions make future predictions extremely difficult. Most of those contacted were of the opinion that some staff expansion is necessary just to attain present needs and requirements. Growth estimates of from 5 percent to 25 percent across all occupational categories were most common.

Recent slippage and the inability (because of funding) to fill current vacancies has hampered logical workforce planning in the agency. The Office is expanding its Section 208 and Section 303 planning functions, partially in conjunction with the Department of Natural Resources. Some growth in the number of planners can reasonably be expected. Ohio is also likely to undergo increased activity in the construction grant field over the next five years which will require more civil engineers and grants personnel. Other opinions on possible growth indicate that if any does occur, it will be in the technical fields.

Turnover for the office has been approximately 25 percent in 1975-76. Much of this is not technically turnover, but can more accurately be termed attrition. The result has been an overall decline in the staff size over the past year. While it is felt that salaries are generally competitive, much of the turnover and attrition is in professional categories. There is some feeling that the leveling and minor decline in staff size is not harmful in light of the implementation status of Public Law 92-500; however, it is generally felt that some growth will occur. The amount of workforce expansion is, of course, closely tied to fiscal policies and expenditures to Ohio EPA have not always been adequate in recent years.

In Cleveland the CRSD expects only limited growth for the next five years. During 1975 CRSD experienced a net increase of nearly 40 positions, but the feeling now is that the workforce will stabilize at near its present level. Three factors which may cause minor workforce growth in most plant job categories include: expansion of the Southerly plant, addition of more communities to CRSD, and a possible centralized maintenance system. In general limited growth in technical fields is anticipated, with the potential for larger growth in legal enforcement activities.

In 1975 CRSD staff turnover was approximately 21 percent; 68 of 320 people left the District during the year. In contrast to many other agencies, most of this turnover occurred among operators rather than among professional and administrative personnel. Persons interviewed at CRSD feel salaries are competitive at most levels, and this probably accounts for lower turnover rates.

Because Ohio has certified wastewater operator personnel for many years, little future growth is expected in this area. As treatment methods become more sophisticated and widespread the need for higher grade operators is likely to increase. These operators will have to be upgraded from present lower classifications or receive formal educational training.

In July of 1977 Ohio plans to implement a certification requirement for industrial waste treatment personnel and sewer maintenance personnel. New classifications and standards will need to be developed and implemented. Currently workforce profile figures in this area are being developed by the Ohio EPA Office of Wastewater Pollution Control; growth in the number of certified operators in this area is likely to occur although numbers cannot be determined.

Officials with ORSANCO project moderate growth over the next five years, but do not feel that it will approach the doubling of the staff size that occurred from 1974 to 1976. A recent EPA grant to research organic matter in the Ohio River added three people and is indicative of the type of growth likely to occur. Increasing concern with non-point sources will also increase workforce needs. Most new openings will be for life scientists and technical investigators in efforts to control Ohio River pollution. Some openings may also develop for sanitary engineers.

Turnover on the ORSANCO staff has been extremely low, and has been negligible in professional categories. Size of the organization and competitive salary structure are cited as the main reasons for staff stability.

D. Training and Certification

As mentioned previously, Ohio was one of the early leaders in mandatory certification of water and sewage plant operators. This long history of involvement has yielded an outstanding operator training program, much of which has been replicated by other states.

The Operator Training Committee of Ohio, Inc. (OTC) is in charge of most operator training and certification programs. The Committee is a non-profit corporation and receives extensive support from Ohio EPA and the Department of Health. A number of courses are offered throughout the year for various operator classifications.

A 60-hour course is offered for Class I trainees, generally in the evenings and spread over 20 weeks. A more advanced 54-hour course for Class II and III personnel is offered several times per year. Class III and IV people can also attend a two-day seminar/workshop in more technical wastewater plant operations. Other course offerings include membrane filters, laboratory testing, management workshop, and an extended aeration workshop. The following table provides a summary of Fiscal Year 1976 training activities and shows training projections for Fiscal Year 1977. Additionally courses are being planned for industrial wastewater and sewer maintenance personnel.

Reproduced from best available copy.

TABLE XXIII

OHIO OPERATOR TRAINING COURSES
FY '76 - FY ' 77

TRAINING COMPLETED DURING FY'76

Course	Locations	Instructors and Panel Members	Hours per Class	Total Instructor Manhours(4.)	Students	Total Student Manhours
Basic Wastewater*	18	18	60	1,080	310	18,600
Advanced Wastewater**	12(1.)	12	54	648	236	12,744
Membrane Filter	1	1	24	240(3.)	98	2,352
Laboratory	6(2.)	10	21	210	210	4,410
Class III Workshop	1	14 panel members	16	224	157	2,512
Management Workshop	1	11 panel members	16	176	93	1,488
Wastewater Collection System Workwhop	1	18 panel members	16	288	190	3,040
Extended Aeration Workshop	1	14 panel members	16	224	125	2,000
TOTALS	41	98	223	3,090	1,419	47,146

PROJECTED TRAINING FOR FY'77

Course	Locations	Instructors and Panel Members	Hours per Class	Total Instructor Manhours(4.)	Students	Total Student Manhours
Basic Wastewater*	20	20	60	1,200	325	19,500
Advanced Wastewater**	12	12	54	648	240	12.960
Membrane Filter	1	1	24	240(3.)	140	3,360
Laboratory***	6(2.)	10	21	210	150	3,150
Class III Workshop	1	16	16	256	150.	2,400
Management Workshop	1	16	16	256	120	1,920
Wastewater Collection System Workshop***	1	16	16	256	175	2,800
Extended Aeration Workshop***	1	16	16	256	150	2,400
TOTALS	43	107	223	3,322	1,450	48,490

* The basic course is for those operators with the least experience and previous training. This program will emphasize the purpose, theory, and use of treatment plant units, how to evaluate the performance of each unit, and calculations involved. Classes consist of twenty three-hour sessions to be held at locations throughout the state.

** The advanced course is for the more advanced operator who has taken and completed the first course or has obtained his Class I certification. This training program will emphasize the purpose, theory and use of treatment plant units, how to evaluate the performance of each unit, and the calculations involved. Classes consist of nine six-hour day-time sessions to be held at selected locations throughout the state.

*** Added in FY'76

Footnotes

(1.) 2 classes in one location
(2.) 4 classes in 3 locations
(3.) 24 hours per month for 10 months
(4.) Time does not include preparation

Most public agencies contacted in Ohio noted that a major effort is directed at on-the-job training (OJT) and expressed concern that formal education does not always prepare people for specific job roles. In addition budget restrictions have forced these agencies to reduce or eliminate the sending of staff personnel to outside training activities.

The Office of Operational Support in Ohio EPA does provide some in-house management and secretarial training; tuition assistance programs have been available in the past but are now extremely limited.

CRSD offers a number of internal training programs to upgrade its staff. Courses for operators are available in addition to those offered by the Operator Training Committee. It is felt that this training is necessary because OTC programs are geared for all phases of a small plant, and specialization is necessary for the large-capacity treatment plants. Other course offerings include personnel management, public relations, accounting, first aid, and drug and alcohol abuse. It is anticipated that use will continue to be made of the National Training Center EPA facilities in Cincinnati.

The number of formal educational opportunities which apply specifically to wastewater seem to be limited. It was noted that engineers with proper training are extremely scarce; apparently the needed programs do exist but are turning out limited numbers of people. There appears to be a general shortage of experienced professionals and upper-level operators.

E. Career Potential

It appears that there will be limited growth in Ohio wastewater treatment fields, but the outlook is good for persons with experience in the area. The Office of Wastewater Pollution Control will probably be hiring some engineers, particularly those with wastewater specialties. Section 208 planning activities could result in a need for more planners and for more technical people to carry out the tenets of the legislation. As a consequence of 208 activities, then, careers in water quality management will likely develop, although specific numbers of positions will not be known until regulatory guidelines and federal funding allocations are clearly established.

The implications of certification requirements for industrial waste treatment facilities and sewer maintenance have not been fully determined. However, it can be expected that some careers in this area, particularly in the private sector, will be developing. Based on opinions given by larger city agencies, the career potential for Class IV wastewater treatment personnel should be very good.

The wastewater career potential for Ohio could be termed bright were it not for budget limitations and spending restrictions. There is a present need for well-trained and experienced personnel; fiscal policies and future legislative mandates must be considered the dominant factors in career development.

F. Conclusion

Moderate growth and turnover replacement will be the keys in the wastewater workforce over the next five years. Persons hired will generally be those in the same occupational categories as are presently on staff; however, people with speciality training or wastewater experience will be at a premium. In local programs some growth in enforcement jobs may occur. Currently the number of certified operators appears to be adequate although shifts to other classifications may be necessary.

The need for more and better formal education programs was widely voiced. Both technical and four-year institutions will need to make some adjustments if expressed concerns are to be satisfied. Current budget limitations at the state level are hampering wastewater plans and programs; future federal legislation in the field could compound the funding problem.

Figure 5

OHIO RIVER VALLEY SANITATION COMMISSION

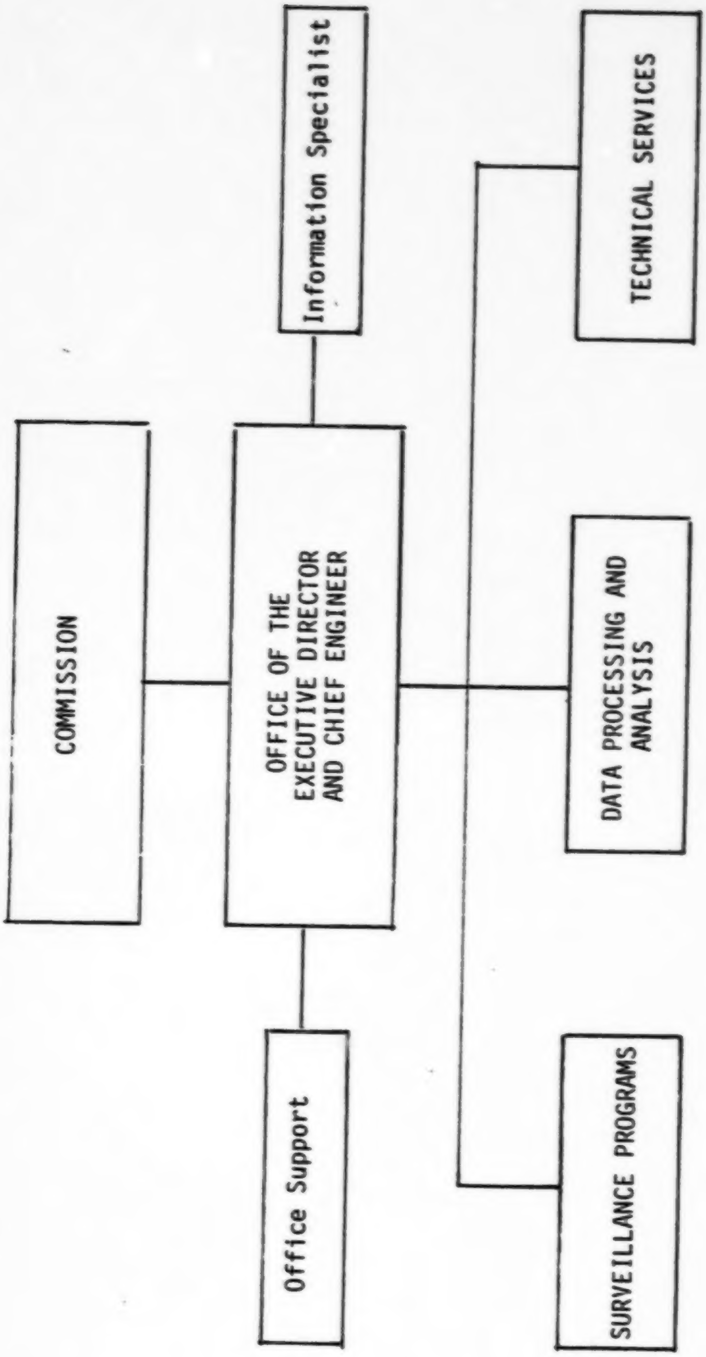
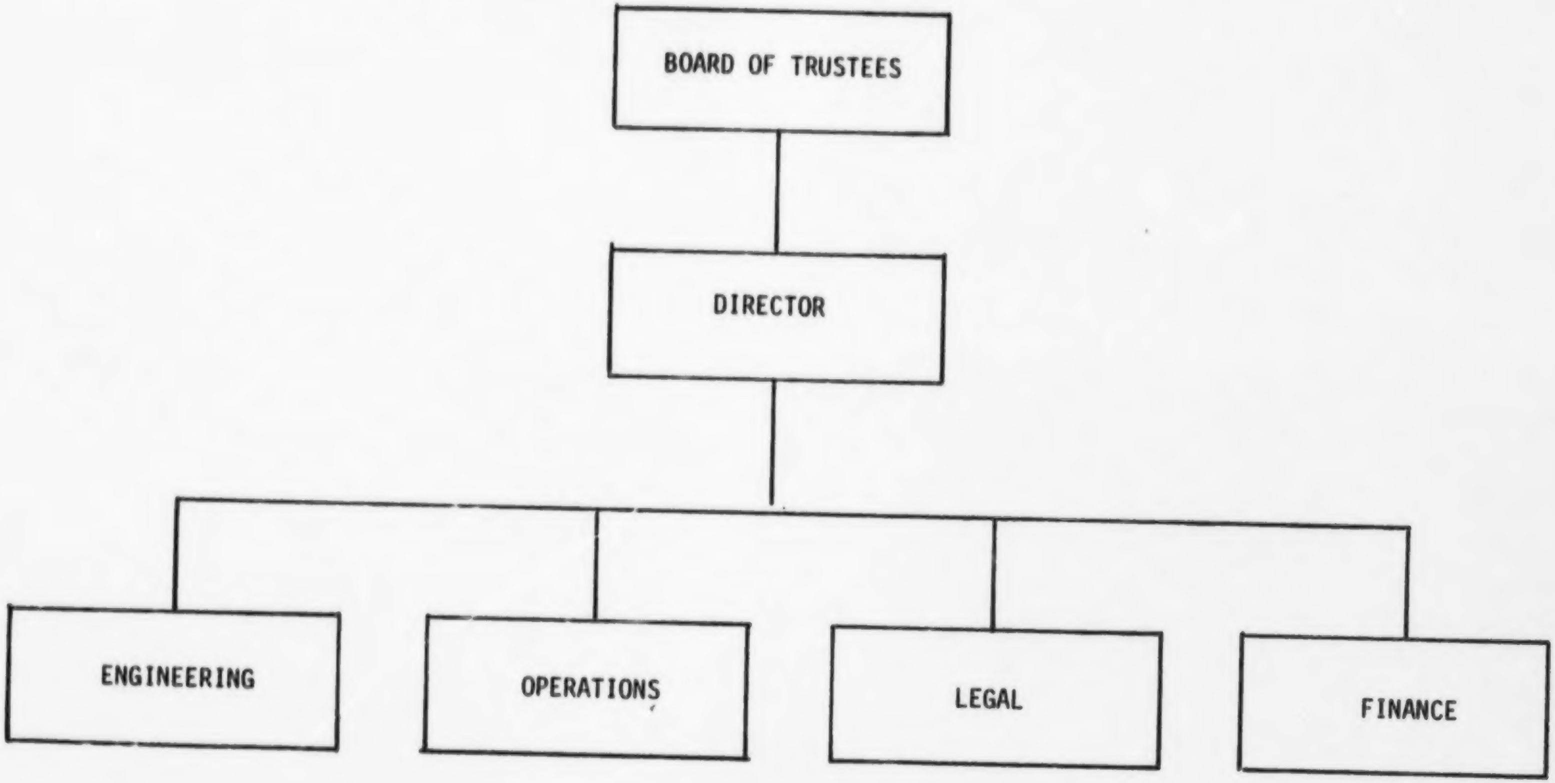

COMMISSION
OFFICE OF THE EXECUTIVE DIRECTOR AND CHIEF ENGINEER
Information Specialist
Office Support
TECHNICAL SERVICES
DATA PROCESSING AND ANALYSIS
SURVEILLANCE PROGRAMS

Figure 6

CLEVELAND REGIONAL SEWER DISTRICT


BOARD OF TRUSTEES
DIRECTOR
ENGINEERING
OPERATIONS
LEGAL
FINANCE

VIII. ENERGY

A. Introduction

The State of Ohio has three governmental units active in the energy area. The Ohio Energy and Resource Development Agency (Ohio ERDA) was established in 1975. Original efforts of this agency were directed at bringing Ohio into compliance with federally-mandated fuel allocation measures. Ohio ERDA is divided into three sections: Research and Development, Policy and Planning, and Bonding and Administrative Services. Current activities of the agency include development of a State Conservation Plan, research on energy and economy matters, contingency planning, petroleum allocation programs, revenue bond financing assistance, and compilation of energy supply and demand information.

The Division of Oil and Gas and the Division of Reclamation, both within the Ohio Department of Natural Resources (ODNR) are the other two state agencies involved in the energy area. The Division of Oil and Gas is a regulatory agency which administers statutes and regulations relating to oil and gas field operations. Permit issuance for well drilling and the prevention land and water pollution due to oil field operations are also within the purview of this Division.

The Division of Reclamation has responsibility for implementation and enforcement of Ohio's strip-mine laws and other mineral laws. Issuance of strip-mine licenses, on-site inspections, and reclamation coordination for unreclaimed strip-mine lands are other duties of the Division.

While Ohio must import a substantial amount of its energy needs, it is still very productive in the oil, gas and coal areas. There are approximately 26,800 wells producing oil or gas in Ohio. In a recent year Ohio produced over 50 million tons of coal, and 90% of the coal operations are surface mines making Ohio second in the nation in this category. A great deal of the Ohio coal is high in sulfur, a fact which limits its use and leads to increased reliance on other forms of energy.

B. Workforce Profile

Ohio ERDA has a staff of 27 full-time persons and a governing board of 10 public officials. There are also 9 authorized positions which are currently vacant.

TABLE XXIV

OHIO ENERGY AND RESOURCE DEVELOPMENT AGENCY

Current (1976) Staffing Level

Position	1976
Engineer	3
Researcher	3
Planner	4
Administrative	7
Clerical	7
Other	3
TOTAL	27

The category "other" includes an attorney, an examiner and a writer; included in the vacant positions are an additional planner, a fiscal officer, and a power management analyst. As reflected in the above table, Ohio ERDA appears to be a research and development agency with a strong policy orientation rather than a technical-assistance agency. The policy orientation has developed of necessity because of the current allocation and planning functions of Ohio ERDA.

The engineers noted in the table are energy specialists and there is an engineering vacancy in the area of advanced technology.

The Division of Oil and Gas has a current staffing level of 24 persons. There are also three vacancies in the Division.

TABLE XXV

OHIO DEPARTMENT OF NATURAL RESOURCES

Division of Oil and Gas
Current (1976) Staffing Level

Position	1976
Field Inspector	15
Engineer	2
Law Enforcement Specialist	1
Draftsman	1
Administrative	1
Clerical	4
TOTAL	24

The largest category, that of field inspectors, are generally filled by people without degrees but who have 10 to 12 years of experience in drilling and plugging operations. According to the Division director, experience is the key to being well qualified for these positions. The inspectors are located in field offices throughout the state, leaving only a staff of nine in Columbus. There are three degreed positions currently on the staff: two petroleum engineers and one petroleum geologist.

The Division of Reclamation of the Department of Natural Resources employs a staff of 43 persons. This total includes six CETA positions; there are currently 15 vacancies in the Division.

TABLE XXVI

OHIO DEPARTMENT OF NATURAL RESOURCES

Division of Reclamation
Current (1976) Staffing Level

Position	1976
Inspector	17
Engineer	2
Environmental Scientist	3
Environmental Technician	2
Attorney	3
Administrative	8
Clerical	8
TOTAL	43

Fifteen members of the staff are located in Columbus and the remaining 28 are distributed in four field offices throughout Ohio. Training backgrounds are varied, but the fields of geology, forestry, and agronomy are strongly represented.

C. Workforce Projections

Overall, Ohio's public sector energy agencies expect to undergo moderate growth for the next five years. Most growth will occur in the Department of Natural Resources because of expanded conservation and reclamation programs. However, staff growth in many areas will be limited because of an effort to limit hiring through fiscal year 1979.

Within Ohio ERDA one of the main areas of attention is the production and utilization of Ohio coal. To help meet this and other goals, the agency anticipates adding one coal specialist engineer and one oil specialist engineer in the 1977-78 biennium. Other vacancies and any new positions are not likely to be filled within the next five years because of budget limitations.

The Division of Oil and Gas expects to grow from its current staff of 24 to perhaps as many as 38 by 1982. Much of this growth is contingent on new laws and expanded enforcement activities for the agency. The Division is currently seeking passage of a law to give it well plugging authority which would require six new positions immediately, probably as field inspectors. Other potential areas of involvement include plugging orphan (old and abandoned) wells and mine plugging operations. The need for more energy is likely to increase the number of drilling operations and manpower needs, even if no other activities are added.

Two new undertakings are likely to yield moderate growth in the Division of Reclamation over the next five years. The All Minerals Law regulating sand, gravel and limestone operations must be implemented in 1977. Approximately six inspectors need to be added in 1977 as a result of this law. One supervisor, one engineer, and one surveyor may also be added in the Columbus office to assist with implementation.

The second area of growth concerns both conservation and pollution abatement as the Bureau of Unreclaimed Strip-Mined Lands and the Division of Reclamation undertake a program called Land Reborn. Essentially this program is an effort to reclaim all or parts of over 340,000 acres of old strip-mined land areas. Projected cost of the project is $400 million. Initially a staff of seven persons will be involved in the following positions: one program coordinator (engineer), four mine reclamation engineers, one grant coordinator, and one clerical.

D. Training and Certification

The permit-issuing activities of the Division of Oil and Gas, for well drilling, and the Division of Reclamation, for strip-mining, have led to special certification programs for inspectors who issue these permits. Reclamation inspectors are required to take exams. In addition, the two Divisions have joined forces in the past for two-week training programs concerning new laws, enforcement techniques, and obtaining evidence of violations.

In response to government and industry needs, Belmont Technical College has begun offering courses in strip-mine reclamation, with emphasis on soil and water testing. Courses in oil and gas technology are available from Hocking Technical College, Muskingum Area Technical College, and College of Wooster.

E. Career Potential

The field of energy is not only very critical to our nation's future, but it is also changing very rapidly. In Ohio the creation of one new agency and the expanded roles for two others provide an indication that workforce needs in this area will continue to grow. The attractiveness of energy production to private industry is well established in the United States. Further growth in the private sector can be expected as efforts are made to more fully utilize present energy sources and to develop new sources.

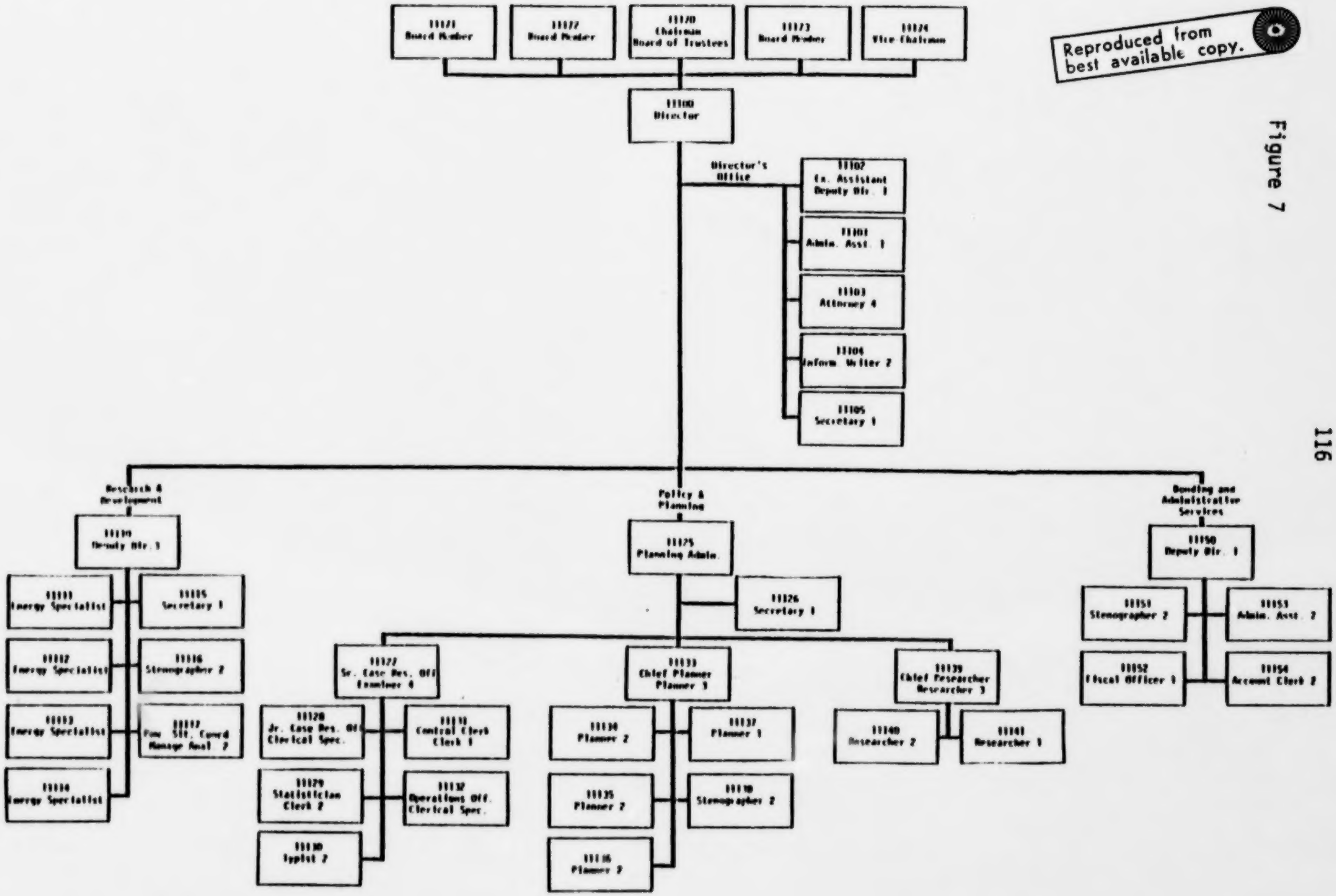
It would appear that most emerging careers will be in the technician and highly degreed areas such as engineers and physical scientists with energy specialization. Problems which must be dealt with in the near future include ways to use high sulfur coal while keeping air pollution under control, and the expansion of nuclear power facilities with their safety and waste disposal requirements. More long-range energy concerns for a populous, industrialized state like Ohio must, of course, be alternate energy sources such as solar and geo-thermal.

F. Conclusion

Ohio's three main energy agencies currently employ 93 people. All indications are that this number will increase moderately in response to needed research, allocation, pollution abatement and reclamation activities. Because the economy of Ohio is heavily dependent on energy, similar workforce needs can be expected to develop in the private sector. Some recently added course offerings by technical colleges represent an early response to this demand.

Figure 7

OHIO ENERGY AND RESOURCE DEVELOPMENT AGENCY


11121 Board Member
11122 Board Member
11120 Chairman Board of Trustees
11123 Board Member
11124 Vice Chairman
11100 Director
Director's Office
11102 Ex. Assistant Deputy Dir. 1
11101 Admin. Asst. 1
11103 Attorney 4
11104 Inform. Writer 2
11105 Secretary 1
Research & Development
11110 Deputy Dir. 3
11111 Energy Specialist
11112 Energy Specialist
11113 Energy Specialist
11114 Energy Specialist
11115 Secretary 1
11116 Stenographer 2
11117 Fin. Sit. Coord Manage Anal 2
Policy & Planning
11125 Planning Admin.
11126 Secretary 1
11127 Sr. Case Res. Off Examiner 4
11128 Jr. Case Res. Off Clerical Spec.
11131 Control Clerk Clerk 1
11129 Statistician Clerk 2
11132 Operations Off. Clerical Spec.
11130 Typist 2
11133 Chief Planner Planner 3
11134 Planner 2
11137 Planner 1
11135 Planner 2
11138 Stenographer 2
11136 Planner 2
11139 Chief Researcher Researcher 3
11140 Researcher 2
11141 Researcher 1
Bonding and Administrative Services
11150 Deputy Dir. 1
11151 Stenographer 2
11153 Admin. Asst. 2
11152 Fiscal Officer 1
11154 Account Clerk 2

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Environmental Research Center
Cincinnati, Ohio

U.S. ENVIRONMENTAL PROTECTION AGENCY
Environmental Research Center
Cincinnati, Ohio

A. Introduction

The Environmental Research Center (ERC) of the U.S. Environmental Protection Agency is located in Cincinnati, Ohio. This addition to the Ohio report will deal with the functions and workforce of the total ERC, and will go into greater detail on the activities of the National Training and Operational Technology Center (NTOTC).

There are four laboratories within ERC, all under the U.S. EPA Assistant Administrator for Research and Development. The four laboratories are: Environmental Monitoring and Support Laboratory (EMSL) within the Office of Monitoring and Technical Support; Industrial Environmental Research Laboratory (IERL) within the Office of Energy, Minerals and Industry; Municipal Environmental Research Laboratory (MERL) within the Office of Air, Land, and Water Use; and Health Effects Research Laboratory (HERL) within the Office of Health and Ecological Effects.

The laboratories noted above are a part of the Office of Research and Development laboratory program which is shown in the following organizational chart. According to EPA, the function of the Office for Research and Development is described as follows:

> This Office is responsible for the development, direction, and conduct of a national research, development, and demonstration program in pollution sources, fate, and health and welfare effects; pollution prevention and control and waste management utilization technology; environmental sciences; and monitoring systems.

The laboratories located at the Cincinnati ERC are responsible for planning, research and development within the specialized areas of their particular program offices.

EMSL: The Office is responsible for the development of reference and standard environmental measurement and monitoring equipment, techniques and systems. It is also involved with quality assurance programs and standardization of analytical methods and sampling techniques. The Laboratory itself performs water sample analysis from all parts of the United States, tests water monitoring equipment, and does filtration system research.

IERL: The Office has responsibility for assessing, and developing methods for control of, the environmental and socioeconomic impacts of energy and mineral resource extraction, processing, conversion, and utilization systems. The Laboratory function focuses on a number of industry activities including oil spills, chemical uses, and mine drainage pollution problems.

MERL: The major role of the Office is in the development and demonstration of cost-effective methods for the prevention or management of pollutant discharge or waste disposal into the environment. The Laboratory is involved in all facets of research on wastewater treatment and re-use, safe water supplies, and solid and hazardous waste problems.

HERL: This Office is responsible for developing health and ecological data needed for the establishment of standards and criteria for specific pollutant control of environmental components. The Laboratory is specifically involved with the health impact of air pollution, auto emissions, and re-usable water supplies.

The Office of Research and Development has recently undertaken a number of organizational changes in the Cincinnati laboratories in the establishment of an Environmental Research Information Center. Complete information on the reorganization was not available at the time of writing of this report.

The National Training and Operational Technology Center (NTOTC) functions as the Municipal Operations and Training Division's primary operational focal point for development of guidance documents, action plans, and training programs. The training programs are designed to assure that the workforce in all governmental sectors are adequately trained to implement an effective water supply program, and water pollution control and abatement program. In addition, NTOTC has primary responsibility for municipal operational assistance programs to upgrade treatment plant effluent quality.

To meet its objectives, NTOTC plans, develops and conducts an annual curriculum of scheduled short-term training courses on causes, prevention and control of water pollution, and operational technology courses. Special emphasis is placed upon training trainers who can then conduct similar or adapted courses within their own jurisdictions according to the needs.

NTOTC has recently been reorganized and now consists of three branches: the Program Support Training Branch (PSTB); the Operational Technology Branch (OTB); and the Program Coordination and Support Office (PCSO). PSTB is responsible for development and implementation of direct training program substrategies, guidance documents, and action plans for assuring a trained water pollution control workforce.

OTB is responsible for similar activity in the operation and maintenance of municipal water and wastewater treatment facilities. This Branch also provides expertise on municipal wastewater treatment facilities in efforts achieve water quality through the Construction Grant and the Municipal Compliance Assurance Programs. The main function of PCSO is the coordination of training needs development, training course development, evaluation of NTOTC output, and administrative and financial support.

A new element of NTOTC is the Instructional Resource Center (IRC). The IRC will assist instructors, educational and training organizations, and other persons interested in water pollution control education by providing a clearinghouse of training materials and programs. It is anticipated that IRC will improve the quality of water pollution personnel, save developmental costs by reducing duplication, and provide support to state agencies.

B. Workforce Profile

As of June 1977, there were 819 persons on staff at the Cincinnati EPA Center. The following table shows the breakdown of the staff in the four laboratories and NTOTC; the remaining 329 persons are employed in either administrative/support division or smaller research divisions.

TABLE XXVII

U.S. ENVIRONMENTAL PROTECTION AGENCY

Environmental Research Center
Cincinnati, Ohio
Current (1976) Staffing by Division

Division		1976
MERL		190
IERL		69
EMSL		90
HERL		113
NTOTC		28
	TOTAL	490

Though no breakdown was available according to job classification, the laboratories are composed almost exclusively of engineers, physical scientists, biological scientists, and laboratory technicians. Most engineers are sanitary engineers with a heavy representation of civil and chemical engineers. Chemistry and biology are the most common areas of emphasis among the scientists; the technicians can be in biological, chemical, or engineering support areas.

The representation of engineers and scientists carries over into NTOTC staffing. Sanitary engineers and chemists are the most common occupations for the Center; in addition, there are a number of technicians, administrators and clerical personnel.

C. Workforce Projections

In 1970 the EPA Center at Cincinnati (then a part of the Federal Water Pollution Control Administration) employed between 1100 and 1200 persons. Staffing has now declined to 819 and all indications are that the decline has leveled off and approximately the present level will be maintained. Most reduction has taken place because of attrition and very little recruitment and hiring has taken place since the Center was established.

Professional judgments of personnel contacted suggest that a Cincinnati staff of from 800 to 850 will be maintained. Hiring will be done to fill positions which become vacant and will be in occupational categories as currently composed. Lower staff levels are partially attributable to an increase in contracting former Center functions to non-governmental organizations. Possible reorganizations and functional changes could have the most impact on workforce growth, but this cannot be determined at the present time.

D. Training and Certification

As the name implies, NTOTC is primarily involved in educational and training activities. A large number of courses have been developed which have been offered primarily to state and local government personnel, federal employees, and private sector persons from all parts of the country. Most courses have been in the water pollution and wastewater areas with some recent emphasis in water supply areas.

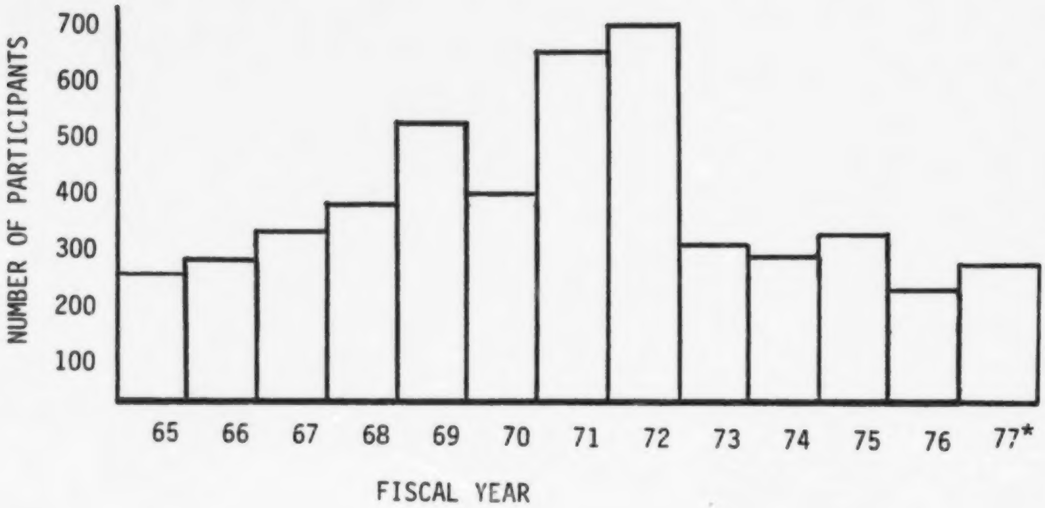
The agenda for most course offerings covers from three to five days of intense, technical instruction; most courses are five days in length. NTOTC personnel and laboratory personnel provide the bulk of the instructional workforce. Training courses are presented based on past activity or requests from particular states. It is now the EPA policy that NTOTC personnel should train the trainers in basic parameters of water pollution so that state and local governments can become self-sufficient in these areas. In addition NTOTC will continue to be active in more technical and specialized training. The following list is a sample of courses offered by NTOTC during FY '76 and FY '77:

1) Chemical Analysis of Water Pollutants;
2) Analytical Methods for Trace Metals;
3) Water Quality and Pollutant Source Monitoring;
4) Inorganic Analysis for Permit Compliance;
5) Biological Treatment Technology;
6) Advanced Wastewater Treatment Technology;
7) Effluent Monitoring Procedures.

Originally NTOTC courses were conducted without tuition charge; a policy of charging for attendance was phased in beginning in FY '73 and participation in training programs dropped drastically at that time. However, attendance has increased in FY '77, a fact that can be at least partially accounted for in budget adjustments at the state and local government levels. The following table shows these attendance trends.

TABLE XXVIII

U.S. ENVIRONMENTAL PROTECTION AGENCY
NTOTC
Training Course Attendance
FY 1965 - FY 1977



*Data available through May 1977 or 8 months of the Fiscal Year.

NTOTC has, in the past, conducted treatment plant training on a one-to-one basis; this involved actually going into a plant and assisting, advising, and supervising it for a period of time. This demonstration type of training has recently been curtailed because of a shortage of funds and a desire for a different approach.

Now NTOTC training, through the OTB, focuses on selecting a model plant in each state and bringing operators, private engineers, and state personnel to that plant for training. There are generally 30 to 40 trainees in each class with four instructors. A variety of treatment and testing techniques can then be demonstrated to a large number of people at one time. It is felt that this approach is more efficient and provides versatility for better training.

E. Career Potential

Limited growth projections seem to indicate few new or expanding career opportunities. The maintenance of present staffing levels will mean hiring of some engineers, physical scientists, biological scientists and technicians. Technical backgrounds will be in demand and specialties in water supply and wastewater treatment will probably be most sought after at the Cincinnati center.

F. Conclusion

The Environmental Research Center will maintain a staff of from 800 to 850 over the next five years. Any growth will be in occupational areas already on staff. NTOTC training functions will continue at least at current levels as the development of training materials and packages receives greater emphasis. Limited growth, however, indicates minimal career potential in the near future.

U.S. ENVIRONMENTAL PROTECTION AGENCY

Office of Research and Development Laboratories

Figure 8

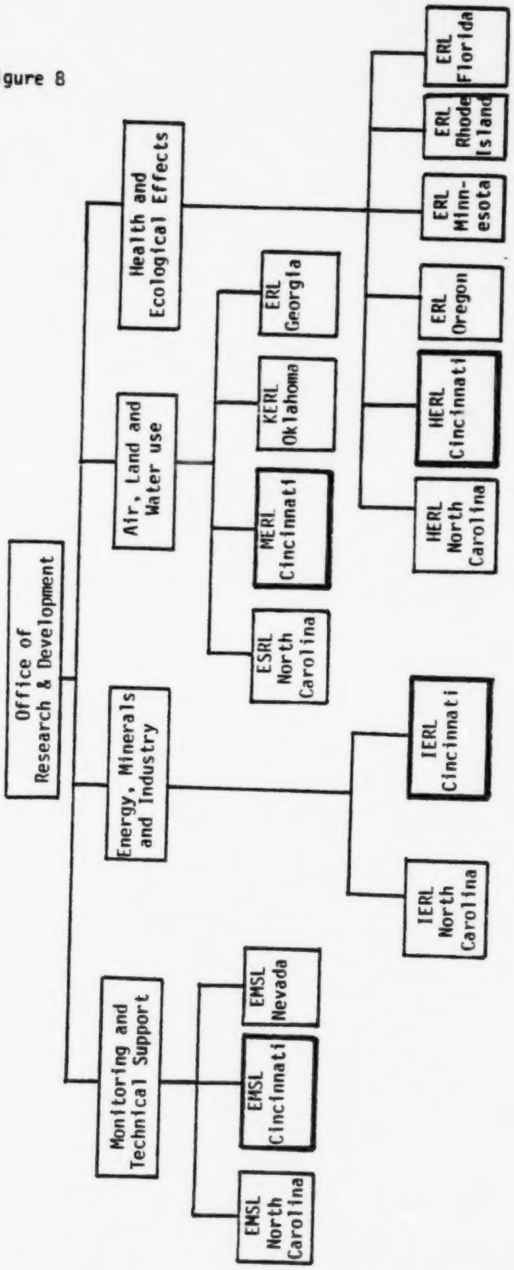
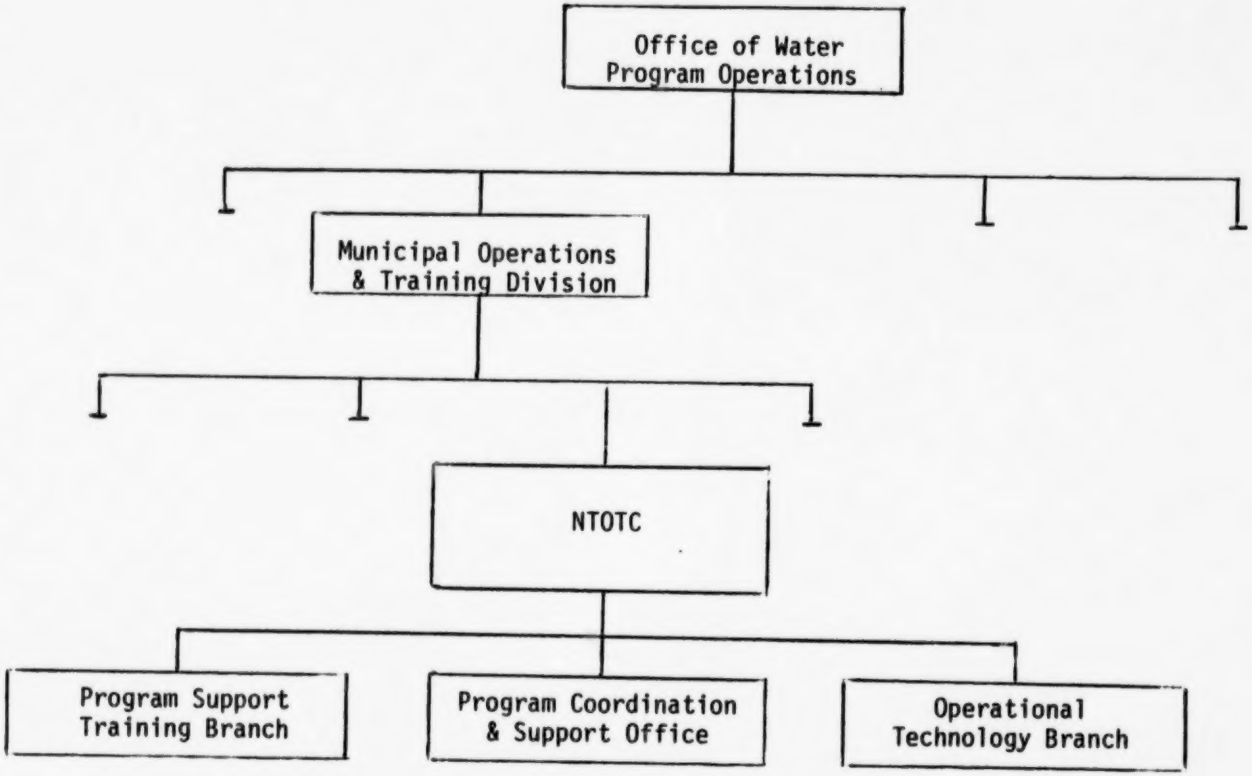

Office of Research & Development
Monitoring and Technical Support
Energy, Minerals and Industry
Air, Land and Water use
Health and Ecological Effects
EMSL North Carolina
EMSL Cincinnati
EMSL Nevada
IERL North Carolina
IERL Cincinnati
ESRL North Carolina
MERL Cincinnati
KERL Oklahoma
ERL Georgia
HERL North Carolina
HERL Cincinnati
ERL Oregon
ERL Minn-esota
ERL Rhode Island
ERL Florida

Figure 9

U.S. ENVIRONMENTAL PROTECTION AGENCY

NATIONAL TRAINING AND
OPERATIONAL TECHNOLOGY CENTER
(NTOTC)

Office of Water Program Operations


Office of Water Program Operations
Municipal Operations & Training Division
NTOTC
Program Support Training Branch
Program Coordination & Support Office
Operational Technology Branch

Selected Post Secondary Institutions With Formal Environmental Energy Programs

In the State of Ohio, institutions of higher education have developed a large number of environmentally-related programs in all parts of the state. Miami University, John Carroll University, Ohio State University, and the University of Cincinnati are but a few of the four-year colleges with environmental curricula. Programs include environmental sciences, ecology, pesticides, environmental health, environmental engineering, and environmental medicine. On the two-year level, Hocking Technical College, Lorain County Community College and Jefferson County Community College and Jefferson County Technical Institute are examples institutions offering programs in Environmental Health Technology, Environmental Engineering Technology, and related programs.

Environmental education in Ohio has made major advances in recent years to deal with increasing pollution problems. The above noted programs are examples, not an exhaustive list. On the following pages, programs of Cleveland State University and Muskingum Area Technical College are examined in greater detail.

SENIOR INSTITUTIONS

Cleveland State University
Cleveland, Ohio

Program: Environmental Engineering (M.S)

Hours required for major: Quarter - -30
Program Inception: 1970
Staff Size: Eight professors (seven part-time), one part-time instructor (8 Ph.D.)
Enrollment: 5
Graduates (1976): 4
Placement: Approximately 50%
Graduate Work: Approximately 50%

Courses

Biology for Engineers
Air Pollution Control
Water Pollution Control
Environmental Pollution Control
Biological Wastewater Treatment
Industrial Problems in Pollution Control
Industrial Water Pollution Control
Principles of Air Pollution Control
Air Pollution Control and Design
Solid Waste Treatment

Program: Environmental Health Sciences (B.S.)

Hours required for major: Quarter - 60
Program Inception: 1971
Staff Size: One professor, one instructor (1 Ph.D., 1 M.S.)
Enrollment: 35
Graduates (1976): 5
Placement: Not available
Graduate Work: 0

Courses

Man and Environment
Cuyahoga River Watershed Study
Man/Urban Ecosystems Interactions
Ecology and Human Affairs
Air Quality Problems
Water Quality Problems

Solid Waste Problems
Air Quality Monitoring
Water Quality Monitoring

COMMUNITY COLLEGES/TECHNICAL INSTITUTIONS

Muskingum Area Technical College
Zanesville, Ohio

Program: Natural Resources Conservation Technology (A.S.)

Hours required for major: Quarter - 66
Program Inception: 1969
Staff Size: Four full-time, one part-time professor (1 Ph.D., 4 M.S.)
Enrollment: 83
Graduates (1976): 25
Placement: 30% to 60%
Graduate Work: 0

Courses (Selected)

- Technical Drawing and Mapping
- Techniques of Environmental Testing
- Wildlife Habitat Management
- Wildlife Population Management
- Soil Science
- Stripmine Reclamation
- Fisheries Management
- Forestry
- Forest Management
- Internship
- Community Service
- Special Problems
- Seminar

Program: Environmental Quality Control Technology (A.S.)

Hours required for major: Quarter - 61
Program Inception: 1969
Staff Size: Four full-time, one part professor (1 Ph.D., 4 M.S.; same staff as Natural Resources Conservation)
Enrollment: 27
Graduates (1976): 12
Placement: 12
Graduate Work: 0

Courses

- Industrial Processing and Pollution Control
- Air Sampling and Analysis

Earth Science
Introduction to Environmental Quality Problems
Water Sampling and Analysis
Emission Control Techniques
Wastewater Treatment Techniques
Stack Gas Sampling and Analysis
Environmental Science Computer Applications
Occupational and Industrial Health
Environmental Quality Laws and Enforcement
Microbiological Techniques
Environmental Instrumentation
Environmental Health
Water Treatment Techniques

Program: Petroleum Engineering Technology (A.S.)

Hours required for major: Quarter - 61
Program Inception: 1975
Staff Size: One full-time professor (M.S.)
Enrollment: 24 full-time, 7 part-time
Graduates: 0
Placement: 0
Graduate Work: 0

Courses

Introduction to Petroleum Technology
Petroleum Geology
Oil and Gas Reservoirs
Petroleum Drilling Methods
Hydraulics
Rig Construction & Drilling Operations
Oil Field Services
Oil and Gas Well Completions
Petroleum Production
Applications in Petroleum Technology
Mineral Rights and Leases
Petroleum Property Management

State Legislation

OHIO GENERAL

TITLE:

Environmental Protection Agency Act
Ohio Code 3745

PURPOSE:

To create an Environmental Protection Agency for the administration of laws relating to air, water and solid waste pollution and general environmental planning.

DEFINITIONS:

ADMINISTERING AUTHORITY:

Environmental Protection Agency
Environmental Board of Review

AUTHORIZATIONS:

To administer environmental laws and comply with federal uidelines;
To undertake studies and make reports to Governor and General Assembly;
To prepare and implement any long-term comprehensive plans;
To prevent and abate environmental pollution;
To issue regulations pursuant to the act;
To provide procedural relief to persons adversely affected.

OHIO AIR

TITLE:

Air Pollution Control Law
Ohio Code 3704

PURPOSE:

To provide for the control of air pollution and protect the public health and safety.

DEFINITIONS:

1. Air contaminant
2. Air pollution
3. Ambient air
4. Emission
5. Person

ADMINISTERING AUTHORITY:

Environmental Protection Agency

AUHTORIZATIONS:

To issue regulations pursuant to the act, particularly regarding ambient air quality standards and air emissions;
To undertake air pollution studies and investigations;
To issue permits for installation and operation of control equipment;
To issue variances;
To maintain monitoring facilities;
To enter and inspect property to enfoce the act;
To develop comprehensive state implementation plan.

PROHIBITED ACTS:

To cause or allow air pollution in violation of rules;
To violate the terms of a permit or variance;
To interfere with enforcement of the act.

EXEMPTIONS:

Industrial health, safety and sanitation measures;
Local standards which are not less stringent.

PENALTIES:

General violations - fines up to $10,000;
Falsification violations - fines up to $25,000.

OHIO PESTICIDES

TITLE:

Economic Poisons and Devices Law
Ohio Code 921.11

PURPOSE:

To provide for control of the registration, labeling and sale of pesticides.

DEFINITIONS:

1. Acaricide
2. Active ingredients
3. Adulterated
4. Antidote
5. Brand
6. Defoliant
7. Desiccant
8. Destructive mammals
9. Device
10. Economic poison
11. Fumigant
12. Fungi
13. Fungicide
14. Herbicide
15. Ingredient statement
16. Insect
17. Inert ingredient
18. Insecticide
19. Label
20. Labeling
21. Misbranded
22. Mite
23. Nematocide
24. Nematode
25. Nuisance or destructive birds
26. Person
27. Plant regulator
28. Product name
29. Registrant
30. Rodenticide
31. Sell
32. Weed

ADMINISTERING AUTHORITY:

Department of Agriculture

AUTHORIZATIONS:

To require registration of all pesticides;
To establish categories of pests and pesticides, and set standards for pesticides;
To issue regulations pursuant to the act;
To seize any misbranded or adulterated pesticides or devices;
To enter and inspect property in enforcement of the act.

PROHIBITED ACTS:

To sell or distribute unregistered or adulterated pesticides;
To alter or deface in any manner a pesticide label.

EXEMPTIONS:

Qualified carriers, public officials, manufacturers of experimental pesticides;
Items solely for export.

PENALTIES:

First offenses - fines up to $100;
Subsequent offenses - fines to $1,000.

OHIO PESTICIDES

TITLE:

Pesticide Use and Application Law
Ohio Code 921.41

PURPOSE:

To provide for the control of certain pesticides through applicator certification and dealer licensing.

DEFINITIONS:

1. Aircraft
2. Beneficial insects
3. Custom application
4. Ground equipment
5. Pest
6. Pesticide
7. Pesticide applicator
8. Pesticide operator
9. Public operator
10. Restricted use pesticide
11. Structure
12. Wildlife

ADMINISTERING AUTHORITY:

Department of Agriculture
Pesticide Advisory Council

AUTHORIZATIONS:

To issue regulations and enforce the act;
To classify pesticides and restrict their use;
To regulate storage, disposal and labeling of pesticides;
To license pesticide dealers;
To certify pesticide applicators;
To enter and inspect property in enforcement of the act.

CERTIFICATION OR LICENSING:

All pesticide applicators, pesticide operators and public operators must be certified for restricted use pesticides through competency examination; ten categories established.

PROHIBITED ACTS:

To engage in use of restricted pesticides without proper certification;
To sell pesticides without a license;
To store or dispose of pesticides in a manner harmful to the environment.

EXEMPTIONS:

Public officials, research personnel, private person on own property, and structural pest control.

PENALTIES:

First violation - fines of up to $200;
Subsequent violations - fines of up to $400 or one year imprisonment.

OHIO RADIATION

TITLE:

Radiation Protection Law
Ohio Code 3701.90

PURPOSE:

To create an advisory council and provide for human and environment protection from radiation sources.

DEFINITIONS:

1. Radiation
2. Radioactive material
3. Radiation device
4. Radiation source
5. Improper radiation
6. Person

ADMINISTERING AUTHORITY:

Department of Health
Radiation Advisory Council

AUTHORIZATIONS:

To administer and enforce the law;
To develop determinations of improper radiation;
To review plans and set standards for improper radiation and control;
To register persons who use, store, produce or dispose of radiation sources;
To issue regulations pursuant to the act regarding control of radiation sources;
To cooperate with federal and state agencies in radiation protection;
To issue radiation emergency orders.

PROHIBITED ACTS:

To fail to register as a user or handler of radiation sources;
To allow any person to be exposed to improper radiation.

EXEMPTIONS:

Diagnostic, therapeutic or other medical purposes.

PENALTIES:

First offense - minor misdemeanor;
Subsequent offenses - second degree misdemeanor.

NRC AGREEMENT STATE: No.

OHIO SOLID WASTE

TITLE:

Solid Waste Disposal Law
Ohio Code 3734

PURPOSE:

To provide for the control of solid waste disposal sites and facilities so as to protect the public health and safety.

DEFINITIONS:

1. Board of Health
2. Director
3. Agency
4. Health district
5. Solid wastes
6. Solid waste disposal
7. Person
8. Open burning
9. Open dumping

ADMINISTERING AUTHORITY:

Environmental Protection Agency
Local Boards of Health

AUTHORIZATIONS:

To issue regulations pursuant to the act, regarding disposal sites and licenses;
To approve of and issue licenses to solid waste disposal facilities;
To limit open dumping and open burning;
To inspect facilities regularly.

PROHIBITED ACTS:

To operate or maintain solid waste disposal facility without proper license;
To fail to comply with open burning and dumping rules.

EXEMPTIONS:

Single family residences;
Temporary storage or actions of licensed political subdivision.

PENALTIES:

Fines of up to $100.

OHIO WASTE WATER

TITLE:

Water Pollution Control Act
Ohio Code 6111

PURPOSE:

To provide for the control of pollution of waters of the state, and over public water supply systems.

DEFINITIONS:

1. Pollution
2. Sewage
3. Industrial waste
4. Other wastes
5. Sewerage system
6. Treatment works
7. Disposal system
8. Waters of the state
9. Person
10. Industrial water pollution control facility
11. Schedule of compliance

ADMINISTERING AUTHORITY:

Environmental Protection Agency

AUTHORIZATIONS:

To develop plans to control and abate water pollution;
To administer federal funds and cooperate with federal agencies;
To conduct water pollution studies and investigations;
To review plans and issue permits for discharge of water pollutants;
To issue regulations regarding prohibition of discharges and facility operation and construction;
To enforce all provisions of the act;
To adopt water quality standards;
To supervise public water supply and waterworks systems;
To analyze public water supplies to ensure quality;
To administer funds for waste treatment works projects.

PROHIBITED ACTS:

To cause pollution of waters of the state;
To violate the terms of a discharge permit;
To submit false information to the agency;
To have cross-connection of public and non-public supplies;
To construct or modify treatment or disposal facilities without proper approval

EXEMPTIONS:

Confined water use areas; septic tanks; state or subdivision facilities; waters from oil or gas production; agricultural run-off.

PENALTIES:

Discharge violations - fines of up to $25,000;
Public water supply and disposal violations - fines of up to $500;
Falsification violations - fines of up to $25,000;
Well violations - fines of up to $100 or $150 for subsequent offenses;
Municipal violations - fines of up to $100.

OHIO ENERGY

TITLE:

Energy and Resource Development Agency Act
Ohio Code - 1975

PURPOSE:

To create a state energy agency to coordinate energy programs and to assist in meeting energy needs and conservation through a number of financial programs.

DEFINITIONS:

1. Governmental agency
2. Energy and resource development facility
3. Cost
4. Owner
5. Revenues
6. Public roads
7. Construction
8. Energy and resource development revenue bonds
9. Person
10. Energy

ADMINISTERING AUTHORITY:

Energy and Resource Development Agency

AUTHORIZATIONS:

To construct power plants and facilities to develop or conserve energy;
To lease or dispose of such facilities;
To administer loan and grant programs for energy development, conservation research, and demonstration projects;
To issue regulations concerning such facilities;
To promote energy conservation and planning;
To allow a tax exemption for coal conversion facilities.